

Appendix Z. Calibration Certificate for Probe and Dipole

The SPEAG calibration certificates are shown as follows.



Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Client B.V. ADT

Certificate No. CLA13-1018_Mar24

Taoyuan City

CALIBRATION CERTIFICATE

Object CLA13 - SN: 1018

Calibration procedure(s) QA CAL-15.v11
Calibration Procedure for SAR Validation Sources below 700 MHz

Calibration date: March 19, 2024

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP2	SN: 104778	30-Mar-23 (No. 217-03804/03805)	Mar-24
Power sensor NRP-Z91	SN: 103244	30-Mar-23 (No. 217-03804)	Mar-24
Power sensor NRP-Z91	SN: 103245	30-Mar-23 (No. 217-03805)	Mar-24
Reference 20 dB Attenuator	SN: CC2552 (20x)	30-Mar-23 (No. 217-03809)	Mar-24
Type-N mismatch combination	SN: 310982 / 06327	30-Mar-23 (No. 217-03810)	Mar-24
Reference Probe EX3DV4	SN: 3877	10-Jan-24 (No. EX3-3877_Jan24)	Jan-25
DAE4	SN: 654	15-Jan-24 (No. DAE4-654_Jan24)	Jan-25
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter NRP2	SN: 107193	08-Nov-21 (in house check Dec-22)	In house check: Dec-24
Power sensor NRP-Z91	SN: 100922	15-Dec-09 (in house check Dec-22)	In house check: Dec-24
Power sensor NRP-Z91	SN: 100418	01-Jan-04 (in house check Dec-22)	In house check: Dec-24
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-22)	In house check: Jun-24
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-22)	In house check: Oct-24

Calibrated by:	Name	Function	Signature
	Jeton Kastrati	Laboratory Technician	
Approved by:	Sven Kühn	Technical Manager	

Issued: March 20, 2024

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Multilateral Agreement for the recognition of calibration certificates

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- IEC/IEEE 62209-1528, "Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- DASY System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:* The source is mounted in a touch configuration below the center marking of the flat phantom.
- Return Loss:* This parameter is measured with the source positioned under the liquid filled phantom (as described in the measurement condition clause). The Return Loss ensures low reflected power. No uncertainty required.
- SAR measured:* SAR measured at the stated antenna input power.
- SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	ELI4 Flat Phantom	Shell thickness: 2 ± 0.2 mm
EUT Positioning	Touch Position	
Zoom Scan Resolution	$dx, dy = 4.0$ mm, $dz = 1.4$ mm	Graded Ratio = 1.4 (Z direction)
Frequency	13 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	55.0	0.75 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	52.8 ± 6 %	0.72 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	1 W input power	0.524 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	0.537 W/kg ± 18.4 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	1 W input power	0.327 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	0.335 W/kg ± 18.0 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.2 Ω - 1.9 $j\Omega$
Return Loss	- 27.0 dB

Additional EUT Data

Manufactured by	SPEAG
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DASY5 Validation Report for Head TSL

Date: 19.03.2024

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: CLA13; Type: CLA13; Serial: CLA13 - SN: 1018

Communication System: UID 0 - CW; Frequency: 13 MHz

Medium parameters used: $f = 13$ MHz; $\sigma = 0.72$ S/m; $\epsilon_r = 52.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3877; ConvF(15.33, 15.33, 15.33) @ 13 MHz; Calibrated: 06.01.2023
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn654; Calibrated: 15.01.2024
- Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2034
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7501)

CLA Calibration for HSL-LF Tissue/CLA-13, touch configuration, Pin=1W/Zoom Scan, dist=1.4mm (8x10x8)/Cube 0: Measurement grid: $dx=4$ mm, $dy=4$ mm, $dz=1.4$ mm

Reference Value = 30.59 V/m; Power Drift = -0.01 dB

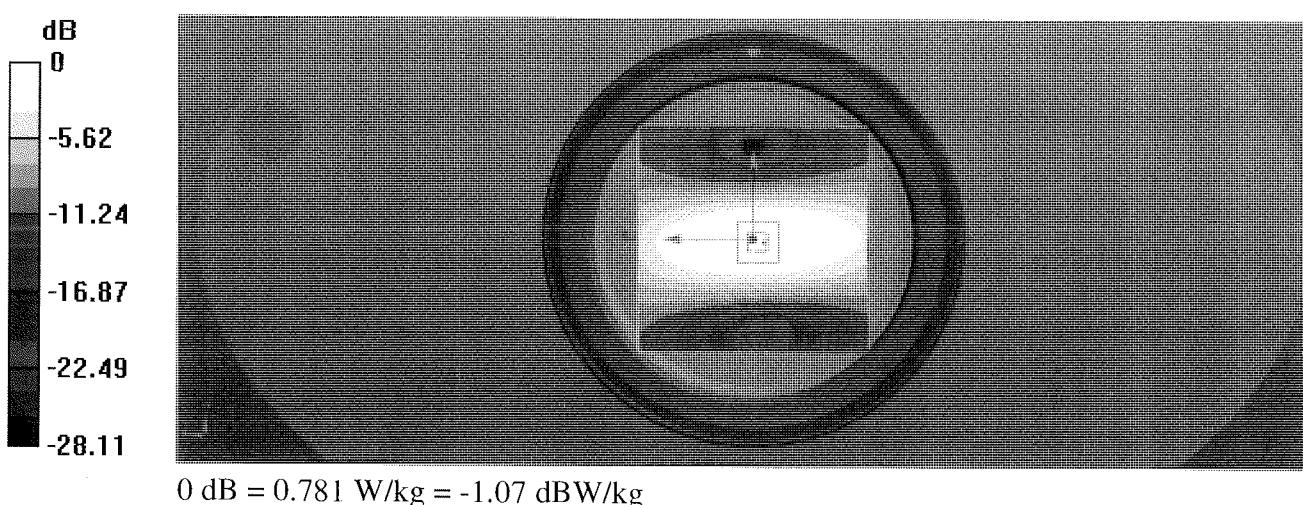
Peak SAR (extrapolated) = 1.07 W/kg

SAR(1 g) = 0.524 W/kg; SAR(10 g) = 0.327 W/kg

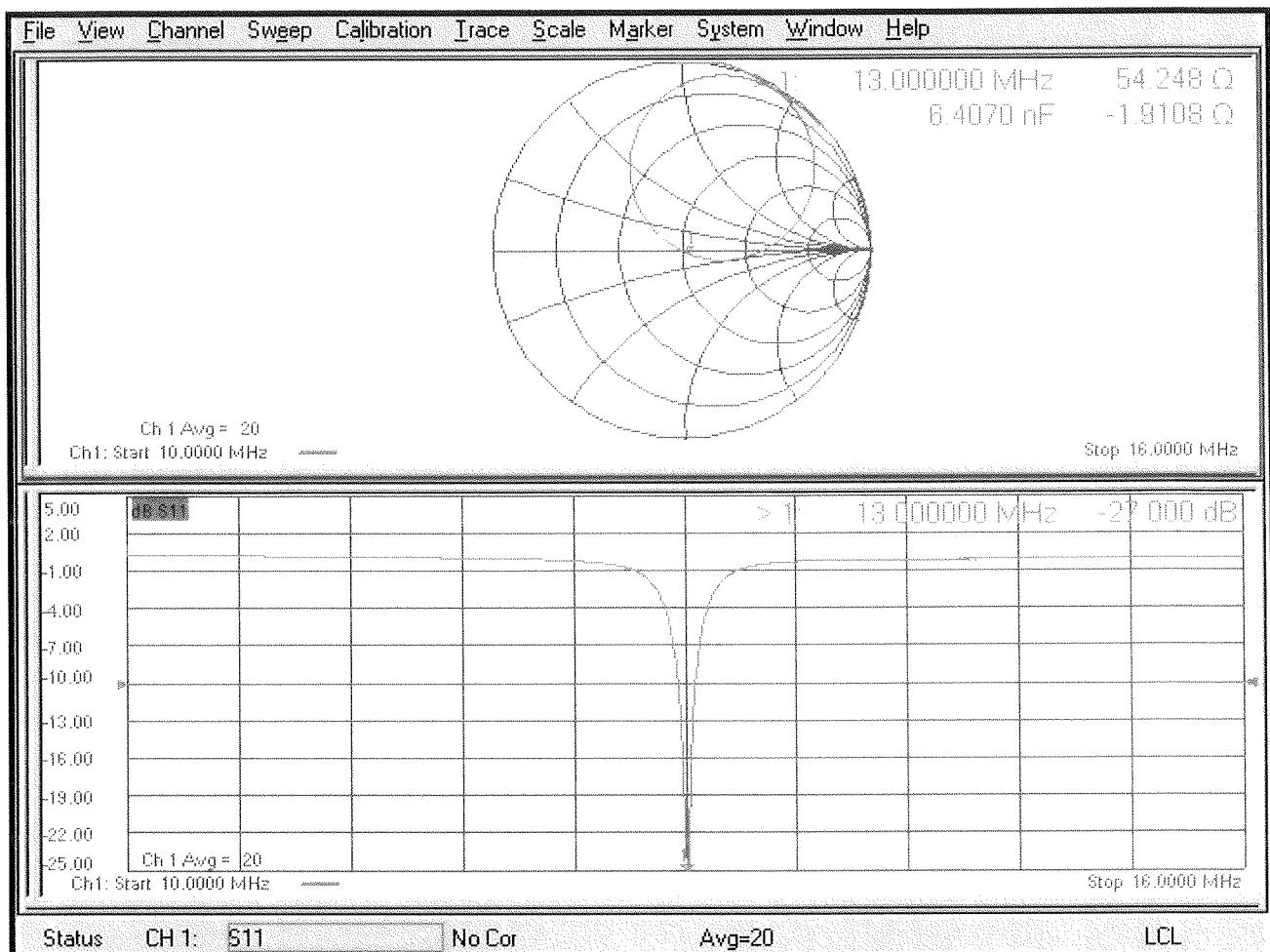
Smallest distance from peaks to all points 3 dB below = 23.3 mm

Ratio of SAR at M2 to SAR at M1 = 78.2%

Maximum value of SAR (measured) = 0.772 W/kg



Impedance Measurement Plot for Head TSL





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 Multilateral Agreement for the recognition of calibration certificates

Client **B.V. ADT**
 Taoyuan City

Certificate No. **D750V3-1013_Aug23**

CALIBRATION CERTIFICATE

Object **D750V3 - SN:1013**

Calibration procedure(s) **QA CAL-05.v12**
 Calibration Procedure for SAR Validation Sources between 0.7-3 GHz

Calibration date: **August 21, 2023**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP2	SN: 104778	30-Mar-23 (No. 217-03804/03805)	Mar-24
Power sensor NRP-Z91	SN: 103244	30-Mar-23 (No. 217-03804)	Mar-24
Power sensor NRP-Z91	SN: 103245	30-Mar-23 (No. 217-03805)	Mar-24
Reference 20 dB Attenuator	SN: BH9394 (20k)	30-Mar-23 (No. 217-03809)	Mar-24
Type-N mismatch combination	SN: 310982 / 06327	30-Mar-23 (No. 217-03810)	Mar-24
Reference Probe EX3DV4	SN: 7349	10-Jan-23 (No. EX3-7349_Jan23)	Jan-24
DAE4	SN: 601	19-Dec-22 (No. DAE4-601_Dec22)	Dec-23

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-22)	In house check: Oct-24
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-22)	In house check: Oct-24
Power sensor HP 8481A	SN: MY41093315	07-Oct-15 (in house check Oct-22)	In house check: Oct-24
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-22)	In house check: Oct-24
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-22)	In house check: Oct-24

Calibrated by: **Michael Weber** Function: **Laboratory Technician**

Signature

Approved by: **Sven Kühn** Function: **Technical Manager**

Issued: August 22, 2023

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Glossary:

TS	tissue simulating liquid
ConvF	sensitivity in TS / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- IEC/IEEE 62209-1528, "Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- DASY System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TS:* The source is mounted in a touch configuration below the center marking of the flat phantom.
- Return Loss:* This parameter is measured with the source positioned under the liquid filled phantom (as described in the measurement condition clause). The Return Loss ensures low reflected power. No uncertainty required.
- SAR measured:* SAR measured at the stated antenna input power.
- SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TS parameters:* The measured TS parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz \pm 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.9	0.89 mho/m
Measured Head TSL parameters	(22.0 \pm 0.2) °C	42.5 \pm 6 %	0.91 mho/m \pm 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.17 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	8.56 W/kg \pm 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.42 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.61 W/kg \pm 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.3 Ω + 0.1 $j\Omega$
Return Loss	- 29.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.033 ns
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
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DASY5 Validation Report for Head TSL

Date: 21.08.2023

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1013

Communication System: UID 0 - CW; Frequency: 750 MHz

Medium parameters used: $f = 750$ MHz; $\sigma = 0.91$ S/m; $\epsilon_r = 42.5$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.11, 10.11, 10.11) @ 750 MHz; Calibrated: 10.01.2023
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 19.12.2022
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 59.70 V/m; Power Drift = -0.00 dB

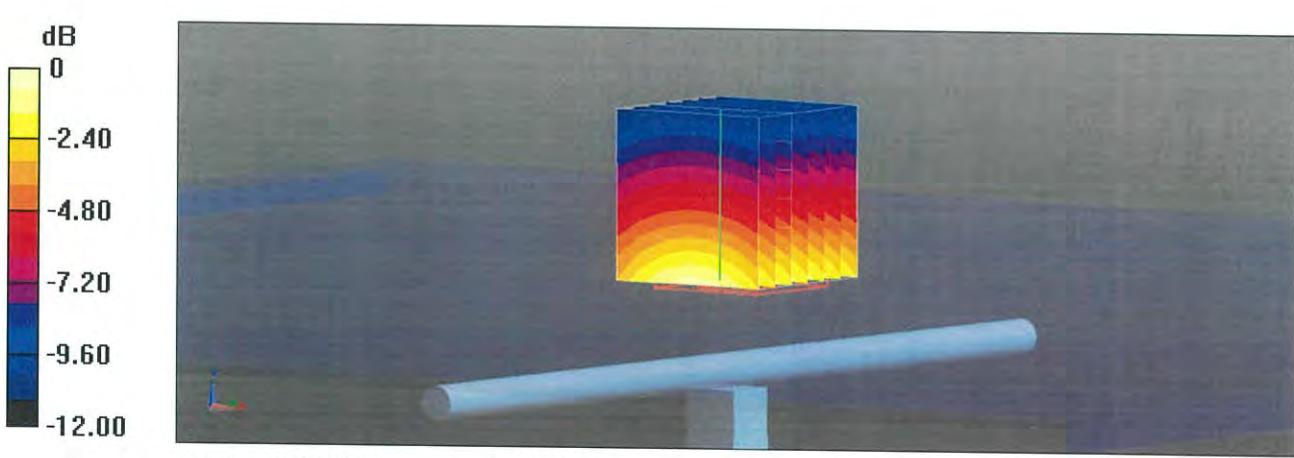
Peak SAR (extrapolated) = 3.29 W/kg

SAR(1 g) = 2.17 W/kg; SAR(10 g) = 1.42 W/kg

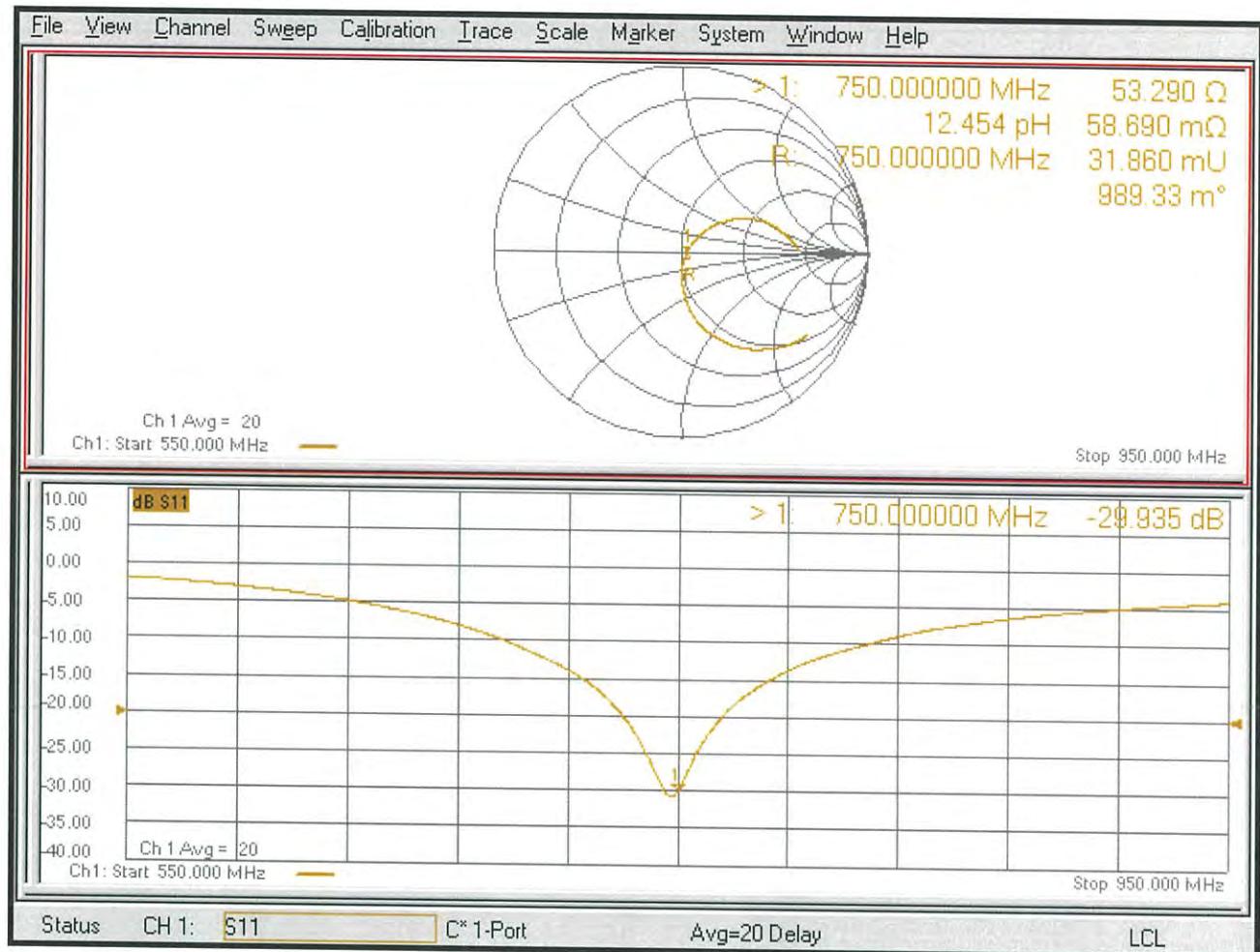
Smallest distance from peaks to all points 3 dB below = 17.9 mm

Ratio of SAR at M2 to SAR at M1 = 65.6%

Maximum value of SAR (measured) = 2.89 W/kg



Impedance Measurement Plot for Head TSL



Calibration Laboratory of

Schmid & Partner

Engineering AG

Zeughausstrasse 43, 8004 Zurich, Switzerland



S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
SCS Swiss Calibration Service

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Client **B.V. ADT**

Taoyuan City

Certificate No. **D835V2-4d121_Aug23****CALIBRATION CERTIFICATE**Object **D835V2 - SN:4d121**

Calibration procedure(s) **QA CAL-05.v12**
 Calibration Procedure for SAR Validation Sources between 0.7-3 GHz

Calibration date: **August 21, 2023**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP2	SN: 104778	30-Mar-23 (No. 217-03804/03805)	Mar-24
Power sensor NRP-Z91	SN: 103244	30-Mar-23 (No. 217-03804)	Mar-24
Power sensor NRP-Z91	SN: 103245	30-Mar-23 (No. 217-03805)	Mar-24
Reference 20 dB Attenuator	SN: BH9394 (20k)	30-Mar-23 (No. 217-03809)	Mar-24
Type-N mismatch combination	SN: 310982 / 06327	30-Mar-23 (No. 217-03810)	Mar-24
Reference Probe EX3DV4	SN: 7349	10-Jan-23 (No. EX3-7349_Jan23)	Jan-24
DAE4	SN: 601	19-Dec-22 (No. DAE4-601_Dec22)	Dec-23

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-22)	In house check: Oct-24
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-22)	In house check: Oct-24
Power sensor HP 8481A	SN: MY41093315	07-Oct-15 (in house check Oct-22)	In house check: Oct-24
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-22)	In house check: Oct-24
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-22)	In house check: Oct-24

Calibrated by: **Michael Weber** Function: **Laboratory Technician**

Approved by: **Sven Kühn** Function: **Technical Manager**

Issued: August 22, 2023

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ConvF	sensitivity in TS / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- IEC/IEEE 62209-1528, "Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- DASY System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:* The source is mounted in a touch configuration below the center marking of the flat phantom.
- Return Loss:* This parameter is measured with the source positioned under the liquid filled phantom (as described in the measurement condition clause). The Return Loss ensures low reflected power. No uncertainty required.
- SAR measured:* SAR measured at the stated antenna input power.
- SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz \pm 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 \pm 0.2) °C	42.3 \pm 6 %	0.94 mho/m \pm 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.50 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	9.72 W/kg \pm 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.62 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	6.32 W/kg \pm 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.1 Ω - 2.0 $j\Omega$
Return Loss	- 34.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.394 ns
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
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DASY5 Validation Report for Head TSL

Date: 21.08.2023

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d121

Communication System: UID 0 - CW; Frequency: 835 MHz

Medium parameters used: $f = 835$ MHz; $\sigma = 0.94$ S/m; $\epsilon_r = 42.3$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.69, 9.69, 9.69) @ 835 MHz; Calibrated: 10.01.2023
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 19.12.2022
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 63.83 V/m; Power Drift = -0.00 dB

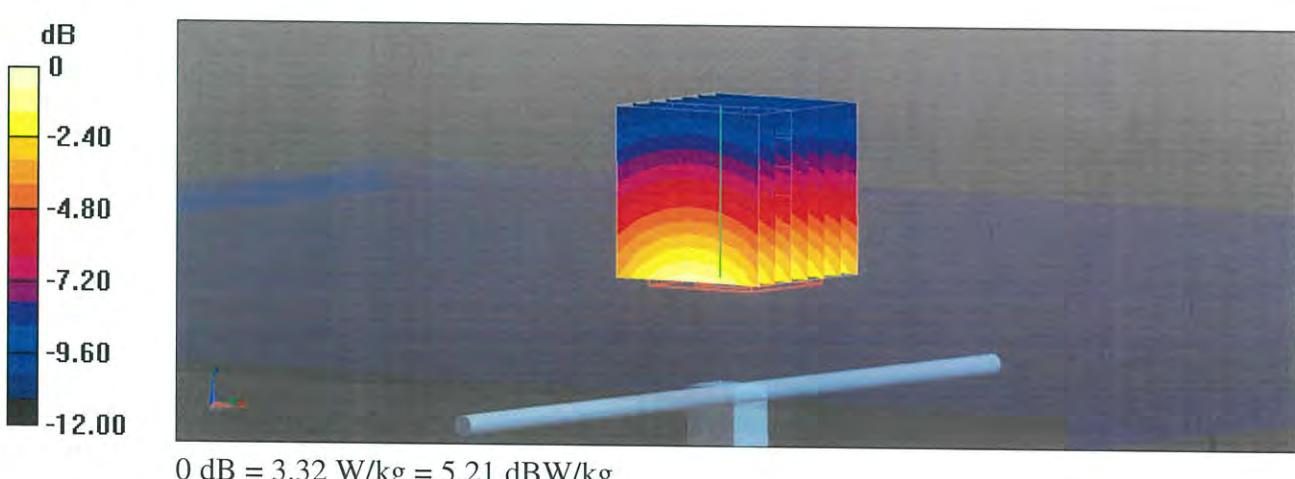
Peak SAR (extrapolated) = 3.72 W/kg

SAR(1 g) = 2.50 W/kg; SAR(10 g) = 1.62 W/kg

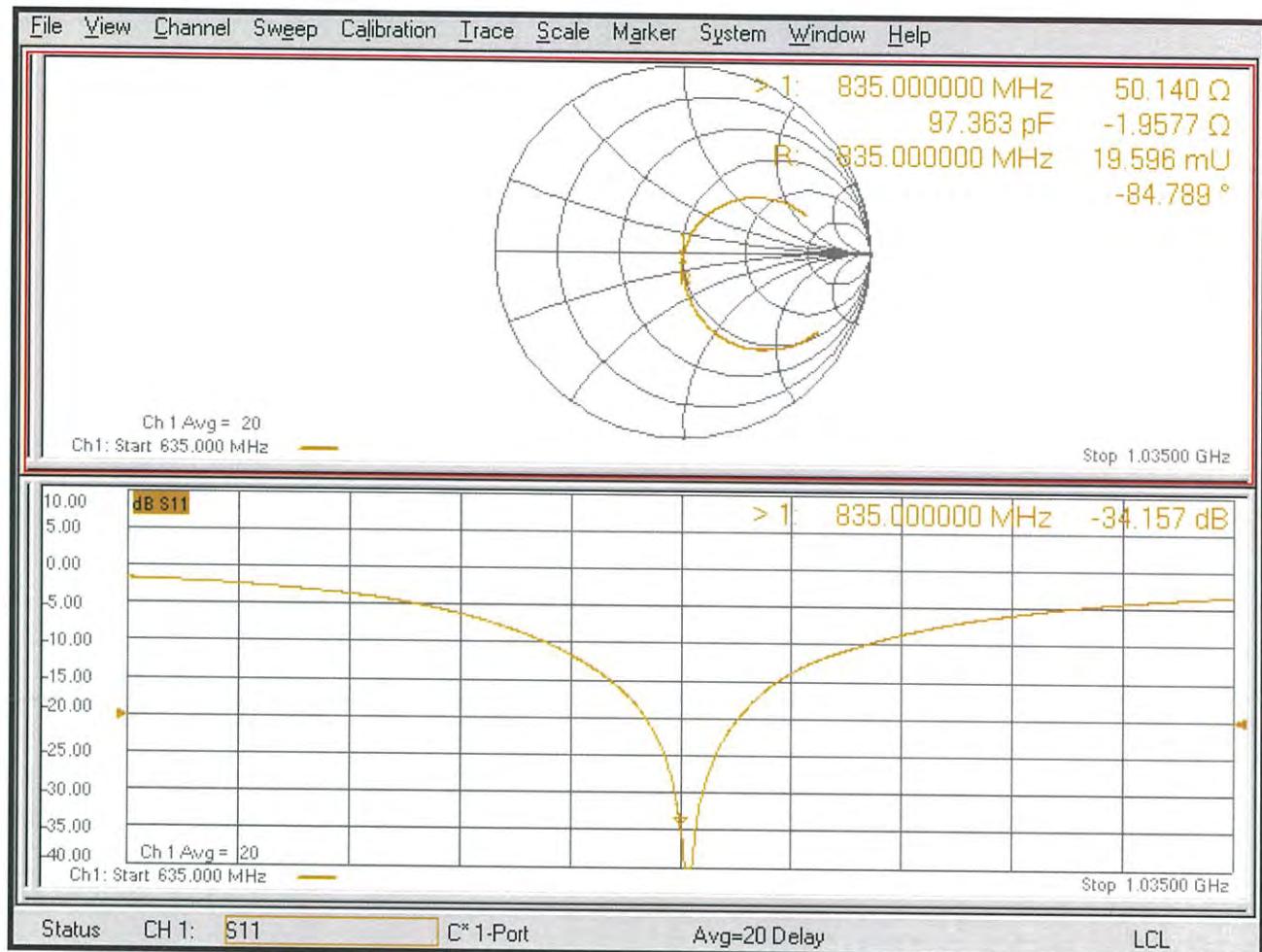
Smallest distance from peaks to all points 3 dB below = 16.8 mm

Ratio of SAR at M2 to SAR at M1 = 66.5%

Maximum value of SAR (measured) = 3.32 W/kg



Impedance Measurement Plot for Head TSL





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Client **B.V. ADT**
 Taoyuan City

Accreditation No.: **SCS 0108**

Certificate No. **D1750V2-1055_Sep23**

CALIBRATION CERTIFICATE

Object **D1750V2 - SN:1055**

Calibration procedure(s) **QA CAL-05.v12**
 Calibration Procedure for SAR Validation Sources between 0.7-3 GHz

Calibration date: **September 21, 2023**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
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Power sensor NRP-Z91	SN: 103244	30-Mar-23 (No. 217-03804)	Mar-24
Power sensor NRP-Z91	SN: 103245	30-Mar-23 (No. 217-03805)	Mar-24
Reference 20 dB Attenuator	SN: BH9394 (20k)	30-Mar-23 (No. 217-03809)	Mar-24
Type-N mismatch combination	SN: 310982 / 06327	30-Mar-23 (No. 217-03810)	Mar-24
Reference Probe EX3DV4	SN: 7349	10-Jan-23 (No. EX3-7349_Jan23)	Jan-24
DAE4	SN: 601	19-Dec-22 (No. DAE4-601_Dec22)	Dec-23

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-22)	In house check: Oct-24
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-22)	In house check: Oct-24
Power sensor HP 8481A	SN: MY41093315	07-Oct-15 (in house check Oct-22)	In house check: Oct-24
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-22)	In house check: Oct-24
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-22)	In house check: Oct-24

Calibrated by: Name **Paulo Pina** Function **Laboratory Technician**

Signature

Approved by: Name **Sven Kühn** Function **Technical Manager**

Issued: September 21, 2023

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Multilateral Agreement for the recognition of calibration certificates

Glossary:

TS	tissue simulating liquid
ConvF	sensitivity in TS / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- a) IEC/IEEE 62209-1528, "Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
- b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- c) DASY System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The source is mounted in a touch configuration below the center marking of the flat phantom.
- *Return Loss:* This parameter is measured with the source positioned under the liquid filled phantom (as described in the measurement condition clause). The Return Loss ensures low reflected power. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1750 MHz \pm 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.1	1.37 mho/m
Measured Head TSL parameters	(22.0 \pm 0.2) °C	40.3 \pm 6 %	1.36 mho/m \pm 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.02 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	36.3 W/kg \pm 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	4.77 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	19.2 W/kg \pm 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	49.5 Ω - 0.6 $j\Omega$
Return Loss	- 42.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.228 ns
----------------------------------	----------

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
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DASY5 Validation Report for Head TSL

Date: 21.09.2023

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1055

Communication System: UID 0 - CW; Frequency: 1750 MHz

Medium parameters used: $f = 1750$ MHz; $\sigma = 1.36$ S/m; $\epsilon_r = 40.3$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.67, 8.67, 8.67) @ 1750 MHz; Calibrated: 10.01.2023
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 19.12.2022
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 105.8 V/m; Power Drift = 0.00 dB

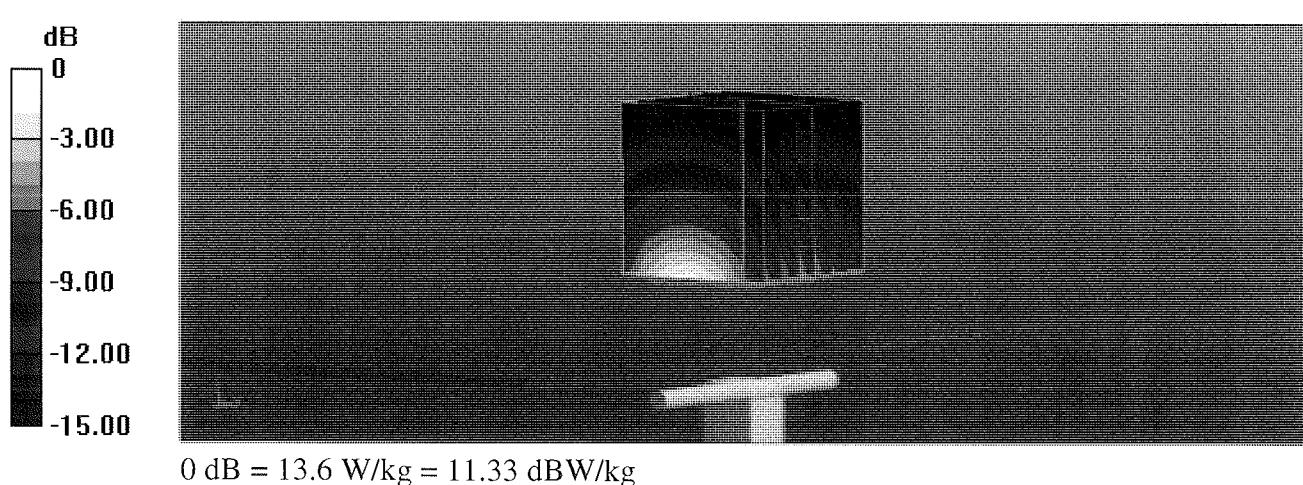
Peak SAR (extrapolated) = 16.5 W/kg

SAR(1 g) = 9.02 W/kg; SAR(10 g) = 4.77 W/kg

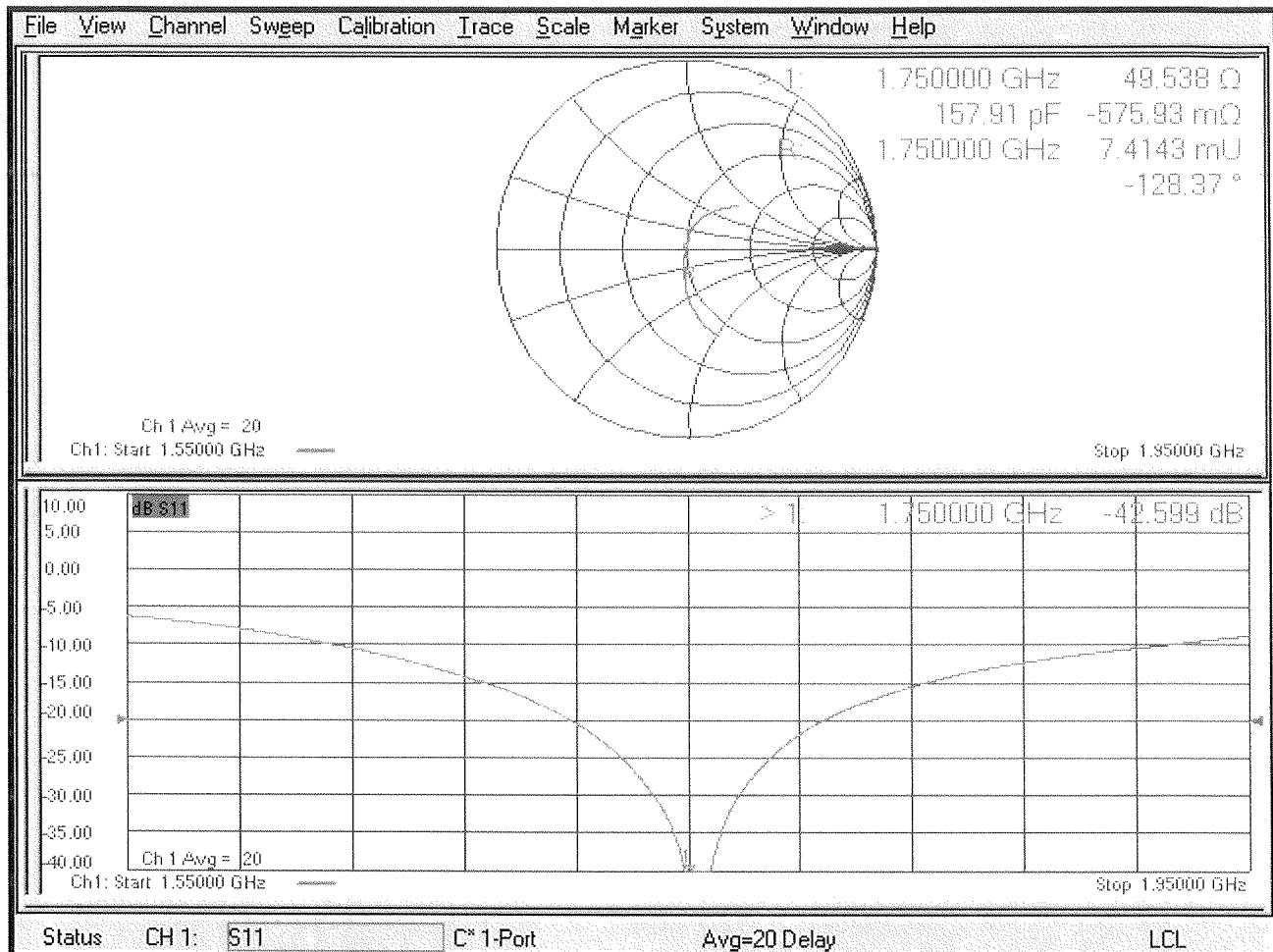
Smallest distance from peaks to all points 3 dB below = 10 mm

Ratio of SAR at M2 to SAR at M1 = 55.4%

Maximum value of SAR (measured) = 13.6 W/kg



Impedance Measurement Plot for Head TSL



Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland



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Client **B.V. ADT**
 Taoyuan City

Accreditation No.: **SCS 0108**

Certificate No. **D1900V2-5d036_Feb24**

CALIBRATION CERTIFICATE

Object **D1900V2 - SN:5d036**

Calibration procedure(s) **QA CAL-05.v12**
 Calibration Procedure for SAR Validation Sources between 0.7-3 GHz

Calibration date: **February 19, 2024**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP2	SN: 104778	30-Mar-23 (No. 217-03804/03805)	Mar-24
Power sensor NRP-Z91	SN: 103244	30-Mar-23 (No. 217-03804)	Mar-24
Power sensor NRP-Z91	SN: 103245	30-Mar-23 (No. 217-03805)	Mar-24
Reference 20 dB Attenuator	SN: BH9394 (20k)	30-Mar-23 (No. 217-03809)	Mar-24
Type-N mismatch combination	SN: 310982 / 06327	30-Mar-23 (No. 217-03810)	Mar-24
Reference Probe EX3DV4	SN: 7349	03-Nov-23 (No. EX3-7349_Nov23)	Nov-24
DAE4	SN: 601	30-Jan-24 (No. DAE4-601_Jan24)	Jan-25

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-22)	In house check: Oct-24
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-22)	In house check: Oct-24
Power sensor HP 8481A	SN: MY41093315	07-Oct-15 (in house check Oct-22)	In house check: Oct-24
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-22)	In house check: Oct-24
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-22)	In house check: Oct-24

Calibrated by: Name **Paulo Pina** Function **Laboratory Technician**

Signature

Approved by: Name **Sven Kühn** Function **Technical Manager**

Signature

Issued: February 20, 2024

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Zeughausstrasse 43, 8004 Zurich, Switzerland



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S Servizio svizzero di taratura
S Swiss Calibration Service

Accreditation No.: **SCS 0108**

Glossary:

TS	tissue simulating liquid
ConvF	sensitivity in TS / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- IEC/IEEE 62209-1528, "Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- DASY System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TS:* The source is mounted in a touch configuration below the center marking of the flat phantom.
- Return Loss:* This parameter is measured with the source positioned under the liquid filled phantom (as described in the measurement condition clause). The Return Loss ensures low reflected power. No uncertainty required.
- SAR measured:* SAR measured at the stated antenna input power.
- SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TS parameters:* The measured TS parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	$dx, dy, dz = 5 \text{ mm}$	
Frequency	$1900 \text{ MHz} \pm 1 \text{ MHz}$	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	$(22.0 \pm 0.2) \text{ °C}$	$41.4 \pm 6 \text{ %}$	$1.40 \text{ mho/m} \pm 6 \text{ %}$
Head TSL temperature change during test	$< 0.5 \text{ °C}$	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	10.0 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	40.3 W/kg ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.22 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	21.0 W/kg ± 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.3 Ω + 6.3 $j\Omega$
Return Loss	- 24.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.195 ns
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
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DASY5 Validation Report for Head TSL

Date: 19.02.2024

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d036

Communication System: UID 0 - CW; Frequency: 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.4$ S/m; $\epsilon_r = 41.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.43, 8.43, 8.43) @ 1900 MHz; Calibrated: 03.11.2023
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2024
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 108.8 V/m; Power Drift = 0.09 dB

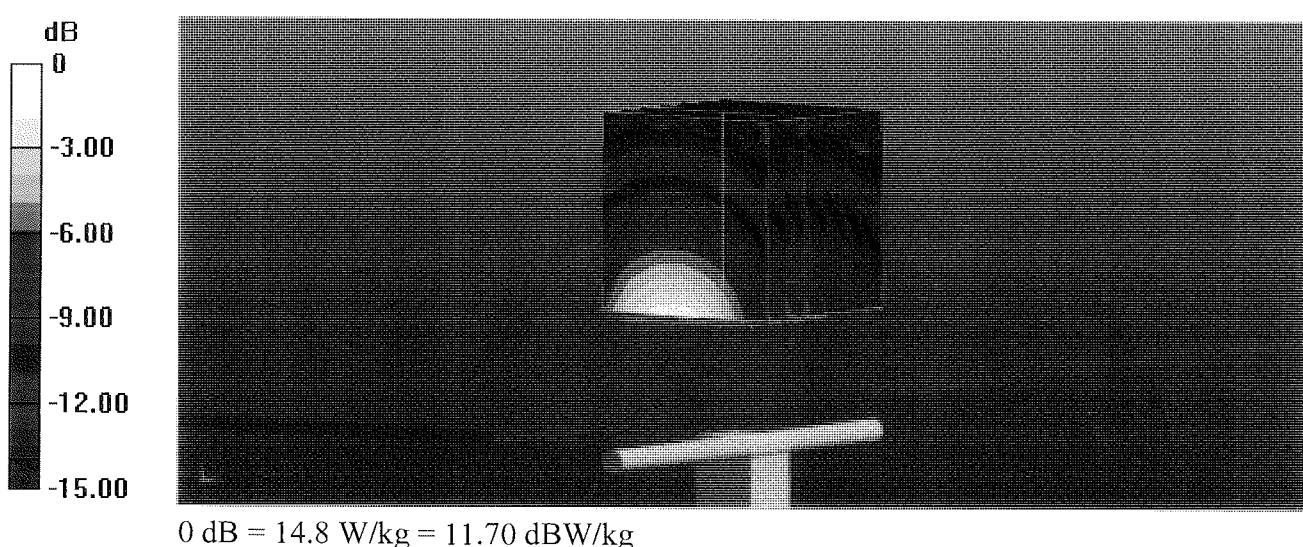
Peak SAR (extrapolated) = 18.3 W/kg

SAR(1 g) = 10.0 W/kg; SAR(10 g) = 5.22 W/kg

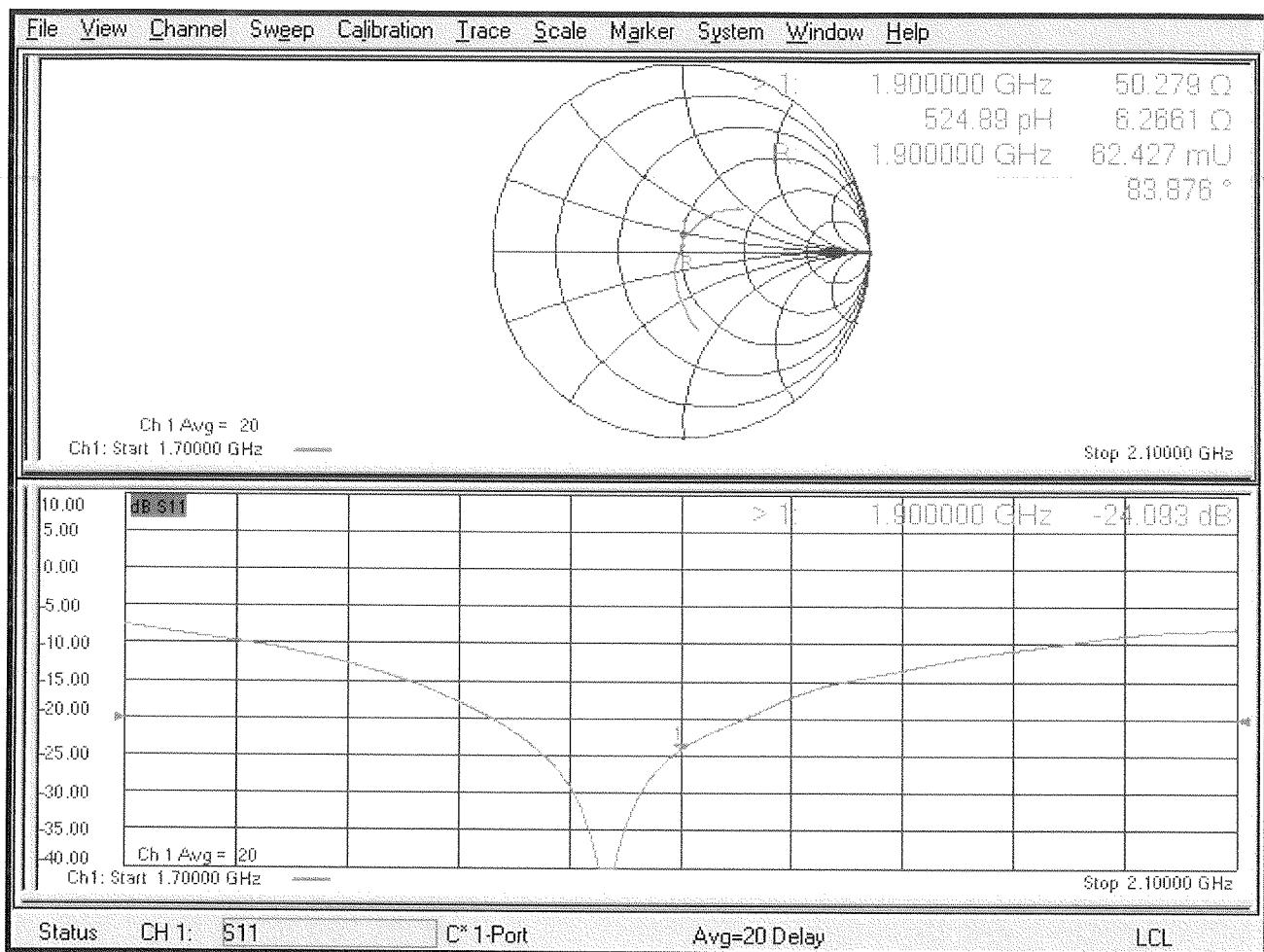
Smallest distance from peaks to all points 3 dB below = 10 mm

Ratio of SAR at M2 to SAR at M1 = 55.3%

Maximum value of SAR (measured) = 14.8 W/kg



Impedance Measurement Plot for Head TSL





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 Multilateral Agreement for the recognition of calibration certificates

Client **B.V. ADT**
 Taoyuan City

Certificate No. **D2450V2-737_Feb24**

CALIBRATION CERTIFICATE

Object **D2450V2 - SN:737**

Calibration procedure(s) **QA CAL-05.v12
 Calibration Procedure for SAR Validation Sources between 0.7-3 GHz**

Calibration date: **February 19, 2024**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP2	SN: 104778	30-Mar-23 (No. 217-03804/03805)	Mar-24
Power sensor NRP-Z91	SN: 103244	30-Mar-23 (No. 217-03804)	Mar-24
Power sensor NRP-Z91	SN: 103245	30-Mar-23 (No. 217-03805)	Mar-24
Reference 20 dB Attenuator	SN: BH9394 (20k)	30-Mar-23 (No. 217-03809)	Mar-24
Type-N mismatch combination	SN: 310982 / 06327	30-Mar-23 (No. 217-03810)	Mar-24
Reference Probe EX3DV4	SN: 7349	03-Nov-23 (No. EX3-7349_Nov23)	Nov-24
DAE4	SN: 601	30-Jan-24 (No. DAE4-601_Jan24)	Jan-25

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-22)	In house check: Oct-24
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-22)	In house check: Oct-24
Power sensor HP 8481A	SN: MY41093315	07-Oct-15 (in house check Oct-22)	In house check: Oct-24
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-22)	In house check: Oct-24
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-22)	In house check: Oct-24

Calibrated by:	Name	Function	Signature
	Krešimir Franjić	Laboratory Technician	
Approved by:	Sven Kühn	Technical Manager	

Issued: February 19, 2024

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S Swiss Calibration Service

Accreditation No.: **SCS 0108**

Accredited by the Swiss Accreditation Service (SAS)

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Multilateral Agreement for the recognition of calibration certificates

Glossary:

TS	tissue simulating liquid
ConvF	sensitivity in TS / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- a) IEC/IEEE 62209-1528, "Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
- b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- c) DASY System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TS:* The source is mounted in a touch configuration below the center marking of the flat phantom.
- *Return Loss:* This parameter is measured with the source positioned under the liquid filled phantom (as described in the measurement condition clause). The Return Loss ensures low reflected power. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TS parameters:* The measured TS parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.5 ± 6 %	1.87 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.5 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	52.9 W/kg ± 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.26 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.7 W/kg ± 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.2 Ω + 5.2 $j\Omega$
Return Loss	- 23.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.161 ns
----------------------------------	----------

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
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DASY5 Validation Report for Head TSL

Date: 19.02.2024

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:737

Communication System: UID 0 - CW; Frequency: 2450 MHz

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.87$ S/m; $\epsilon_r = 38.5$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.96, 7.96, 7.96) @ 2450 MHz; Calibrated: 03.11.2023
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2024
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 117.0 V/m; Power Drift = 0.03 dB

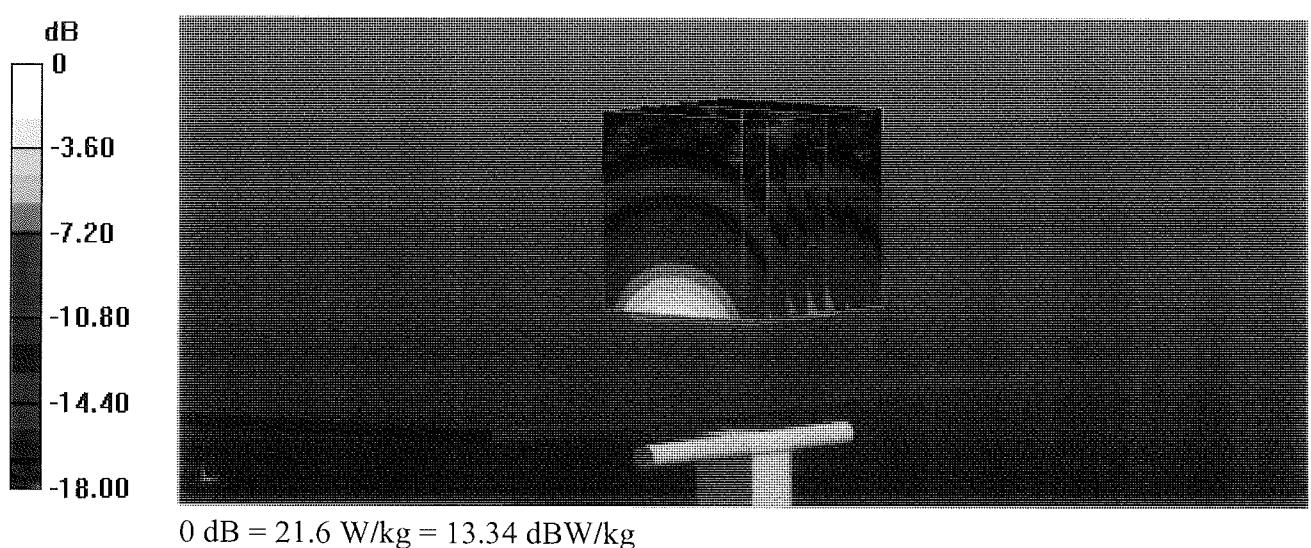
Peak SAR (extrapolated) = 27.0 W/kg

SAR(1 g) = 13.5 W/kg; SAR(10 g) = 6.26 W/kg

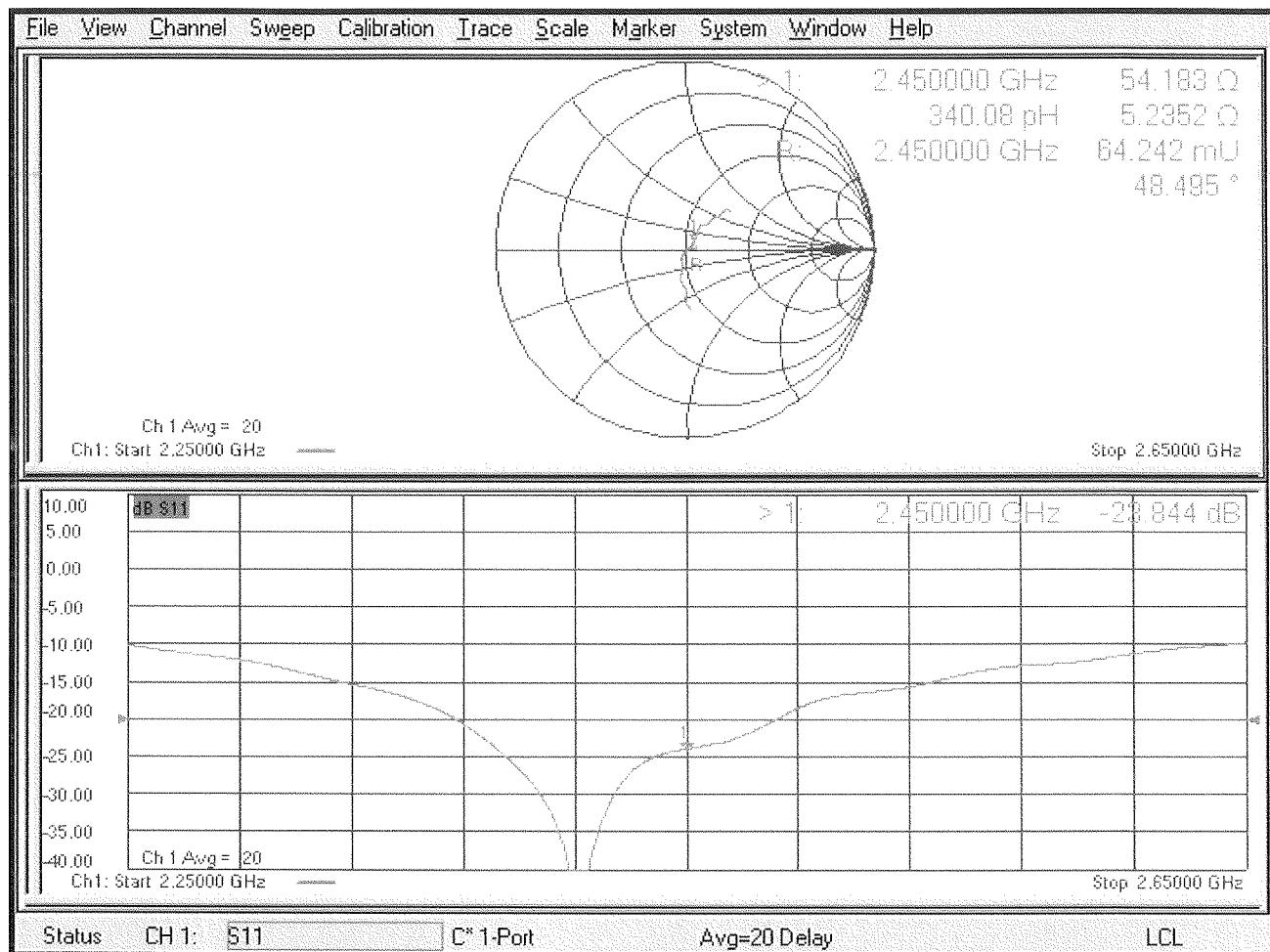
Smallest distance from peaks to all points 3 dB below = 9 mm

Ratio of SAR at M2 to SAR at M1 = 50.9%

Maximum value of SAR (measured) = 21.6 W/kg



Impedance Measurement Plot for Head TSL





Accredited by the Swiss Accreditation Service (SAS)

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 Multilateral Agreement for the recognition of calibration certificates

Client **B.V. ADT**
 Taoyuan City

Certificate No. **D2600V2-1020_Aug23**

CALIBRATION CERTIFICATE

Object **D2600V2 - SN:1020**

Calibration procedure(s) **QA CAL-05.v12**
 Calibration Procedure for SAR Validation Sources between 0.7-3 GHz

Calibration date: **August 18, 2023**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^\circ\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP2	SN: 104778	30-Mar-23 (No. 217-03804/03805)	Mar-24
Power sensor NRP-Z91	SN: 103244	30-Mar-23 (No. 217-03804)	Mar-24
Power sensor NRP-Z91	SN: 103245	30-Mar-23 (No. 217-03805)	Mar-24
Reference 20 dB Attenuator	SN: BH9394 (20k)	30-Mar-23 (No. 217-03809)	Mar-24
Type-N mismatch combination	SN: 310982 / 06327	30-Mar-23 (No. 217-03810)	Mar-24
Reference Probe EX3DV4	SN: 7349	10-Jan-23 (No. EX3-7349_Jan23)	Jan-24
DAE4	SN: 601	19-Dec-22 (No. DAE4-601_Dec22)	Dec-23

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-22)	In house check: Oct-24
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-22)	In house check: Oct-24
Power sensor HP 8481A	SN: MY41093315	07-Oct-15 (in house check Oct-22)	In house check: Oct-24
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-22)	In house check: Oct-24
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-22)	In house check: Oct-24

Calibrated by: **Michael Weber** **Name** **Function** **Laboratory Technician**

Signature

Approved by: **Sven Kühn** **Name** **Function** **Technical Manager**

Issued: August 22, 2023

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Multilateral Agreement for the recognition of calibration certificates

Glossary:

TS	tissue simulating liquid
ConvF	sensitivity in TS / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- IEC/IEEE 62209-1528, "Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- DASY System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TS:* The source is mounted in a touch configuration below the center marking of the flat phantom.
- Return Loss:* This parameter is measured with the source positioned under the liquid filled phantom (as described in the measurement condition clause). The Return Loss ensures low reflected power. No uncertainty required.
- SAR measured:* SAR measured at the stated antenna input power.
- SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TS parameters:* The measured TS parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2600 MHz \pm 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.0	1.96 mho/m
Measured Head TSL parameters	(22.0 \pm 0.2) °C	37.6 \pm 6 %	1.99 mho/m \pm 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	14.2 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	55.9 W/kg \pm 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.43 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	25.5 W/kg \pm 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	46.9 Ω - 4.8 $j\Omega$
Return Loss	- 24.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.158 ns
----------------------------------	----------

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
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DASY5 Validation Report for Head TSL

Date: 18.08.2023

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN:1020

Communication System: UID 0 - CW; Frequency: 2600 MHz

Medium parameters used: $f = 2600$ MHz; $\sigma = 1.99$ S/m; $\epsilon_r = 37.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.84, 7.84, 7.84) @ 2600 MHz; Calibrated: 10.01.2023
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 19.12.2022
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 119.3 V/m; Power Drift = -0.00 dB

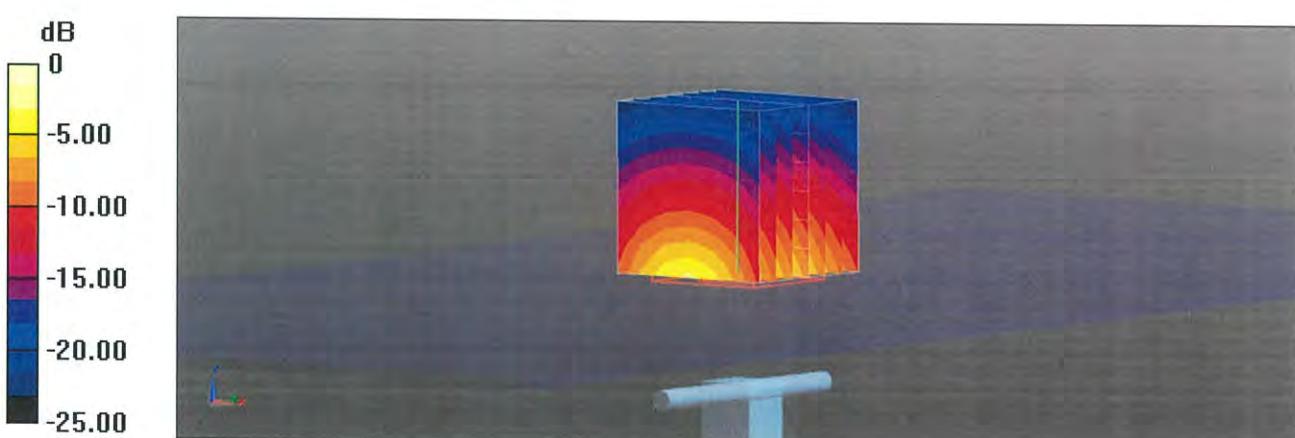
Peak SAR (extrapolated) = 27.8 W/kg

SAR(1 g) = 14.2 W/kg; SAR(10 g) = 6.43 W/kg

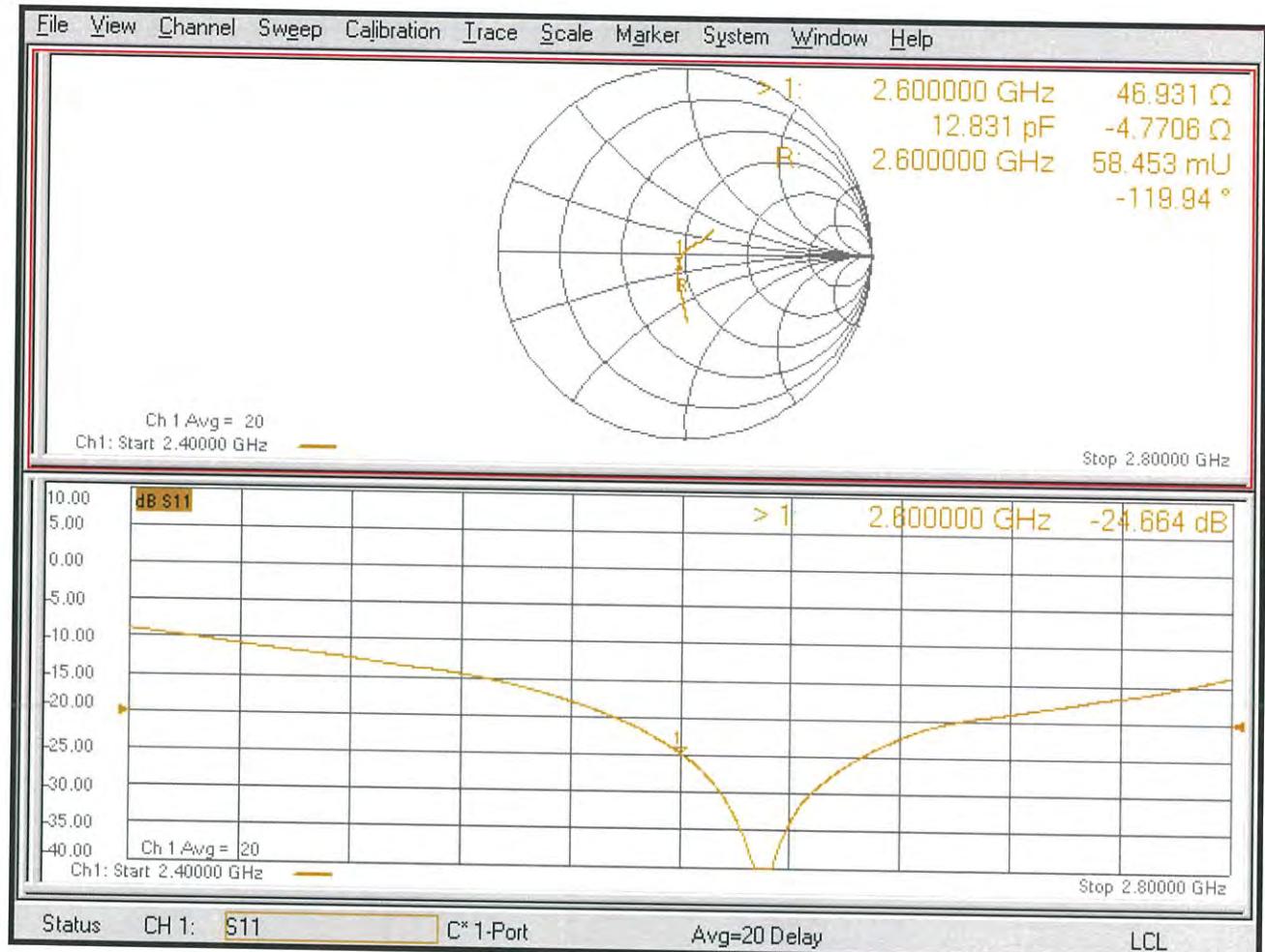
Smallest distance from peaks to all points 3 dB below = 9 mm

Ratio of SAR at M2 to SAR at M1 = 51.3%

Maximum value of SAR (measured) = 23.5 W/kg



Impedance Measurement Plot for Head TSL





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 Multilateral Agreement for the recognition of calibration certificates

Client **B.V. ADT**
Taoyuan City

Certificate No. **D3500V2-1007_Jan24**

CALIBRATION CERTIFICATE

Object **D3500V2 - SN:1007**

Calibration procedure(s) **QA CAL-22.v7**
Calibration Procedure for SAR Validation Sources between 3-10 GHz

Calibration date: **January 23, 2024**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP2	SN: 104778	30-Mar-23 (No. 217-03804/03805)	Mar-24
Power sensor NRP-Z91	SN: 103244	30-Mar-23 (No. 217-03804)	Mar-24
Power sensor NRP-Z91	SN: 103245	30-Mar-23 (No. 217-03805)	Mar-24
Reference 20 dB Attenuator	SN: BH9394 (20k)	30-Mar-23 (No. 217-03809)	Mar-24
Type-N mismatch combination	SN: 310982 / 06327	30-Mar-23 (No. 217-03810)	Mar-24
Reference Probe EX3DV4	SN: 3503	07-Mar-23 (No. EX3-3503_Mar23)	Mar-24
DAE4	SN: 601	03-Oct-23 (No. DAE4-601_Oct23)	Oct-24
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-22)	In house check: Oct-24
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-22)	In house check: Oct-24
Power sensor HP 8481A	SN: MY41093315	07-Oct-15 (in house check Oct-22)	In house check: Oct-24
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-22)	In house check: Oct-24
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-22)	In house check: Oct-24

Calibrated by: Name **Claudio Leubler** Function **Laboratory Technician**

Approved by: Name **Sven Kühn** Function **Technical Manager**

Issued: January 23, 2024

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Multilateral Agreement for the recognition of calibration certificates

Glossary:

TS	tissue simulating liquid
ConvF	sensitivity in TS / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- a) IEC/IEEE 62209-1528, "Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
- b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- c) DASY System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TS:* The source is mounted in a touch configuration below the center marking of the flat phantom.
- *Return Loss:* This parameter is measured with the source positioned under the liquid filled phantom (as described in the measurement condition clause). The Return Loss ensures low reflected power. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TS parameters:* The measured TS parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	$dx, dy = 4 \text{ mm}, dz = 1.4 \text{ mm}$	Graded Ratio = 1.4 (Z direction)
Frequency	$3500 \text{ MHz} \pm 1 \text{ MHz}$	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	37.9	2.91 mho/m
Measured Head TSL parameters	$(22.0 \pm 0.2) \text{ °C}$	$38.1 \pm 6 \text{ %}$	$2.90 \text{ mho/m} \pm 6 \text{ %}$
Head TSL temperature change during test	$< 0.5 \text{ °C}$	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	6.48 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	64.9 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.46 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.6 W/kg ± 19.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.6 Ω - 3.8 $j\Omega$
Return Loss	- 25.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.141 ns
----------------------------------	----------

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
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DASY5 Validation Report for Head TSL

Date: 23.01.2024

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 3500 MHz; Type: D3500V2; Serial: D3500V2 - SN:1007

Communication System: UID 0 - CW; Frequency: 3500 MHz

Medium parameters used: $f = 3500$ MHz; $\sigma = 2.9$ S/m; $\epsilon_r = 38.1$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(7.91, 7.91, 7.91) @ 3500 MHz; Calibrated: 07.03.2023
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 03.10.2023
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration for Head Tissue/Pin=100 mW, d=10mm, f=3500MHz/Zoom Scan,

dist=1.4mm (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 66.48 V/m; Power Drift = 0.08 dB

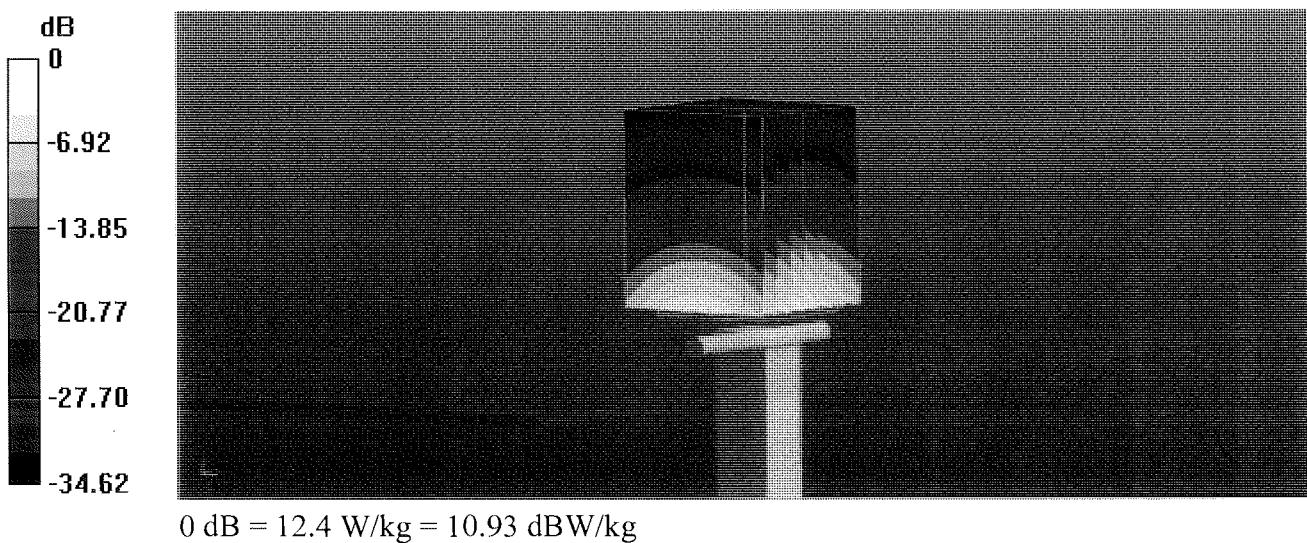
Peak SAR (extrapolated) = 17.1 W/kg

SAR(1 g) = 6.48 W/kg; SAR(10 g) = 2.46 W/kg

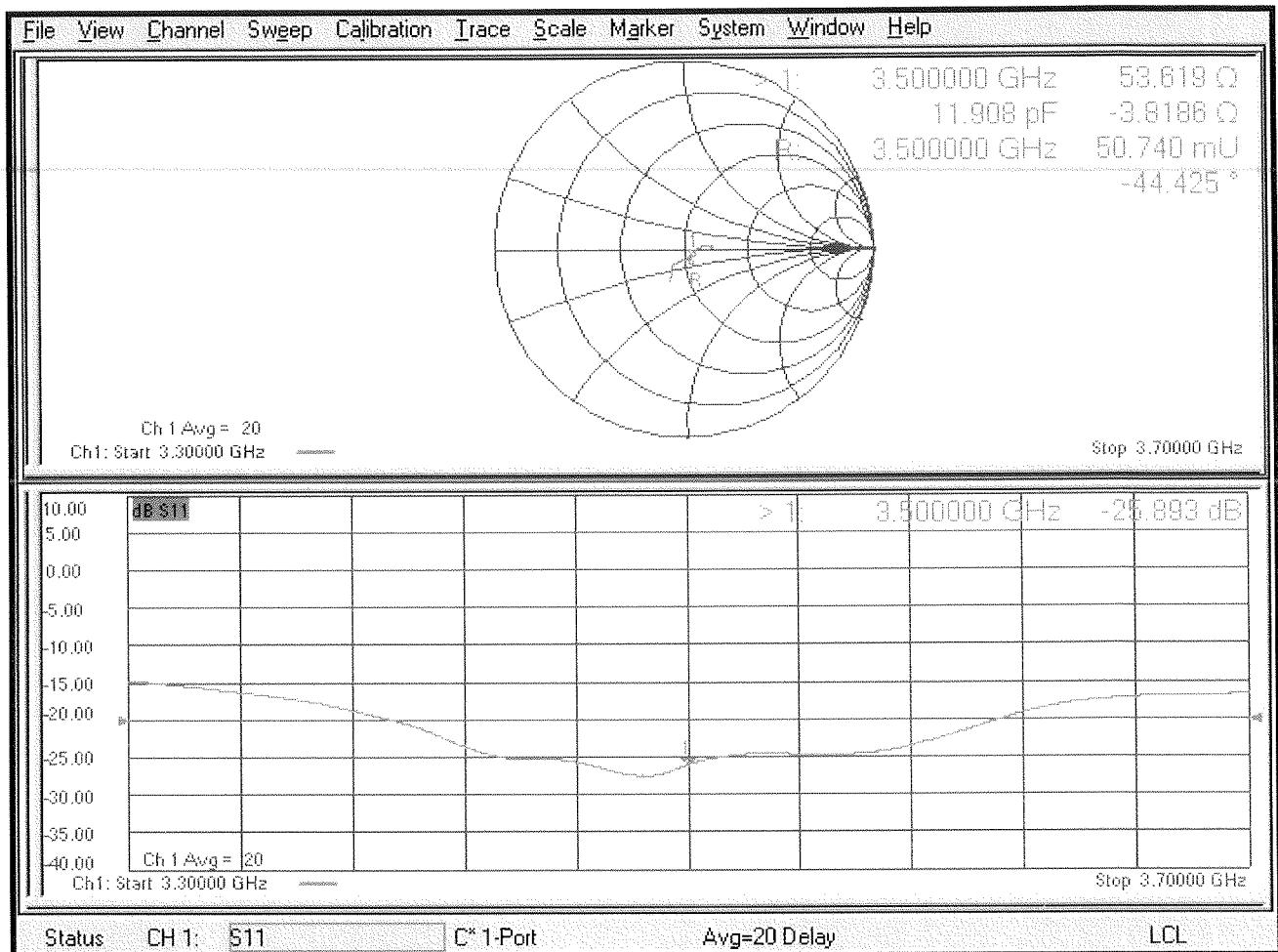
Smallest distance from peaks to all points 3 dB below = 8 mm

Ratio of SAR at M2 to SAR at M1 = 74.9%

Maximum value of SAR (measured) = 12.4 W/kg



Impedance Measurement Plot for Head TSL





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Client **B.V. ADT**
 Taoyuan City

Certificate No. **D3700V2-1017_Feb24**

CALIBRATION CERTIFICATE

Object **D3700V2 - SN:1017**

Calibration procedure(s) **QA CAL-22.v7**
 Calibration Procedure for SAR Validation Sources between 3-10 GHz

Calibration date: **February 15, 2024**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP2	SN: 104778	30-Mar-23 (No. 217-03804/03805)	Mar-24
Power sensor NRP-Z91	SN: 103244	30-Mar-23 (No. 217-03804)	Mar-24
Power sensor NRP-Z91	SN: 103245	30-Mar-23 (No. 217-03805)	Mar-24
Reference 20 dB Attenuator	SN: BH9394 (20k)	30-Mar-23 (No. 217-03809)	Mar-24
Type-N mismatch combination	SN: 310982 / 06327	30-Mar-23 (No. 217-03810)	Mar-24
Reference Probe EX3DV4	SN: 3503	07-Mar-23 (No. EX3-3503_Mar23)	Mar-24
DAE4	SN: 601	30-Jan-24 (No. DAE4-601_Jan24)	Jan-25
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-22)	In house check: Oct-24
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-22)	In house check: Oct-24
Power sensor HP 8481A	SN: MY41093315	07-Oct-15 (in house check Oct-22)	In house check: Oct-24
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-22)	In house check: Oct-24
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-22)	In house check: Oct-24

Calibrated by:	Name	Function	Signature
	Paulo Pina	Laboratory Technician	
Approved by:	Sven Kühn	Technical Manager	

Issued: February 16, 2024

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Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- a) IEC/IEEE 62209-1528, "Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
- b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- c) DASY System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The source is mounted in a touch configuration below the center marking of the flat phantom.
- *Return Loss:* This parameter is measured with the source positioned under the liquid filled phantom (as described in the measurement condition clause). The Return Loss ensures low reflected power. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	$dx, dy = 4 \text{ mm}, dz = 1.4 \text{ mm}$	Graded Ratio = 1.4 (Z direction)
Frequency	$3700 \text{ MHz} \pm 1 \text{ MHz}$	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	37.7	3.12 mho/m
Measured Head TSL parameters	$(22.0 \pm 0.2) \text{ °C}$	$38.0 \pm 6 \text{ %}$	$3.07 \text{ mho/m} \pm 6 \text{ %}$
Head TSL temperature change during test	$< 0.5 \text{ °C}$	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	6.53 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	65.6 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.39 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.0 W/kg ± 19.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.1 Ω - 8.8 $j\Omega$
Return Loss	- 21.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.135 ns
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
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DASY5 Validation Report for Head TSL

Date: 15.02.2024

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 3700 MHz; Type: D3700V2; Serial: D3700V2 - SN:1017

Communication System: UID 0 - CW; Frequency: 3700 MHz

Medium parameters used: $f = 3700$ MHz; $\sigma = 3.07$ S/m; $\epsilon_r = 38$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(7.73, 7.73, 7.73) @ 3700 MHz; Calibrated: 07.03.2023
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2024
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration for Head Tissue/Pin=100 mW, d=10mm, f=3700MHz/Zoom Scan, dist=1.4mm (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 67.82 V/m; Power Drift = 0.04 dB

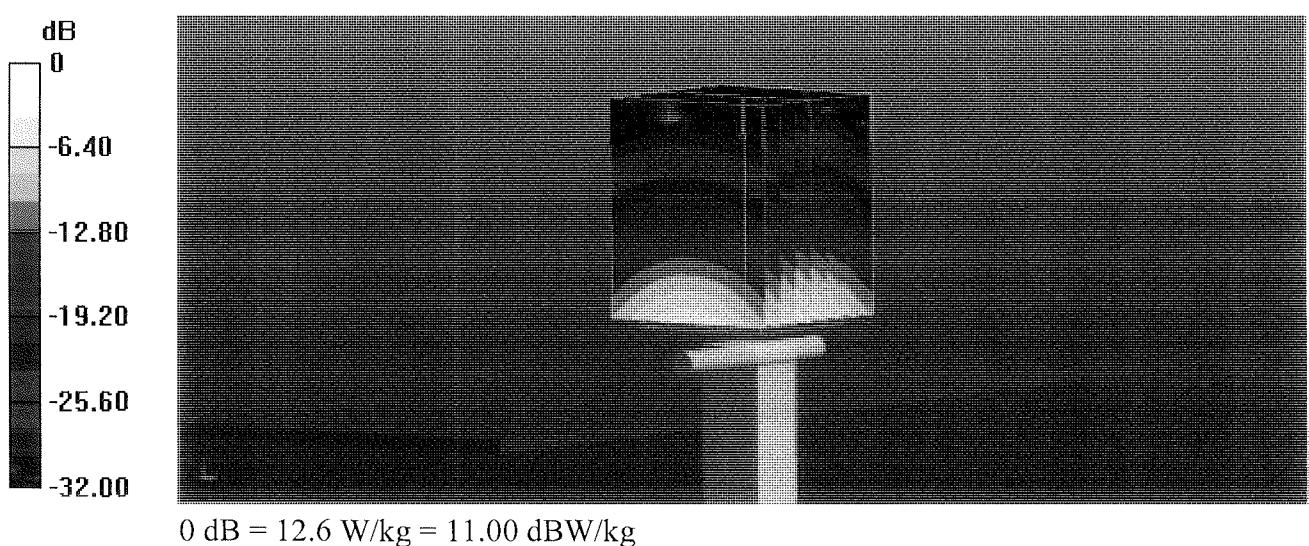
Peak SAR (extrapolated) = 18.3 W/kg

SAR(1 g) = 6.53 W/kg; SAR(10 g) = 2.39 W/kg

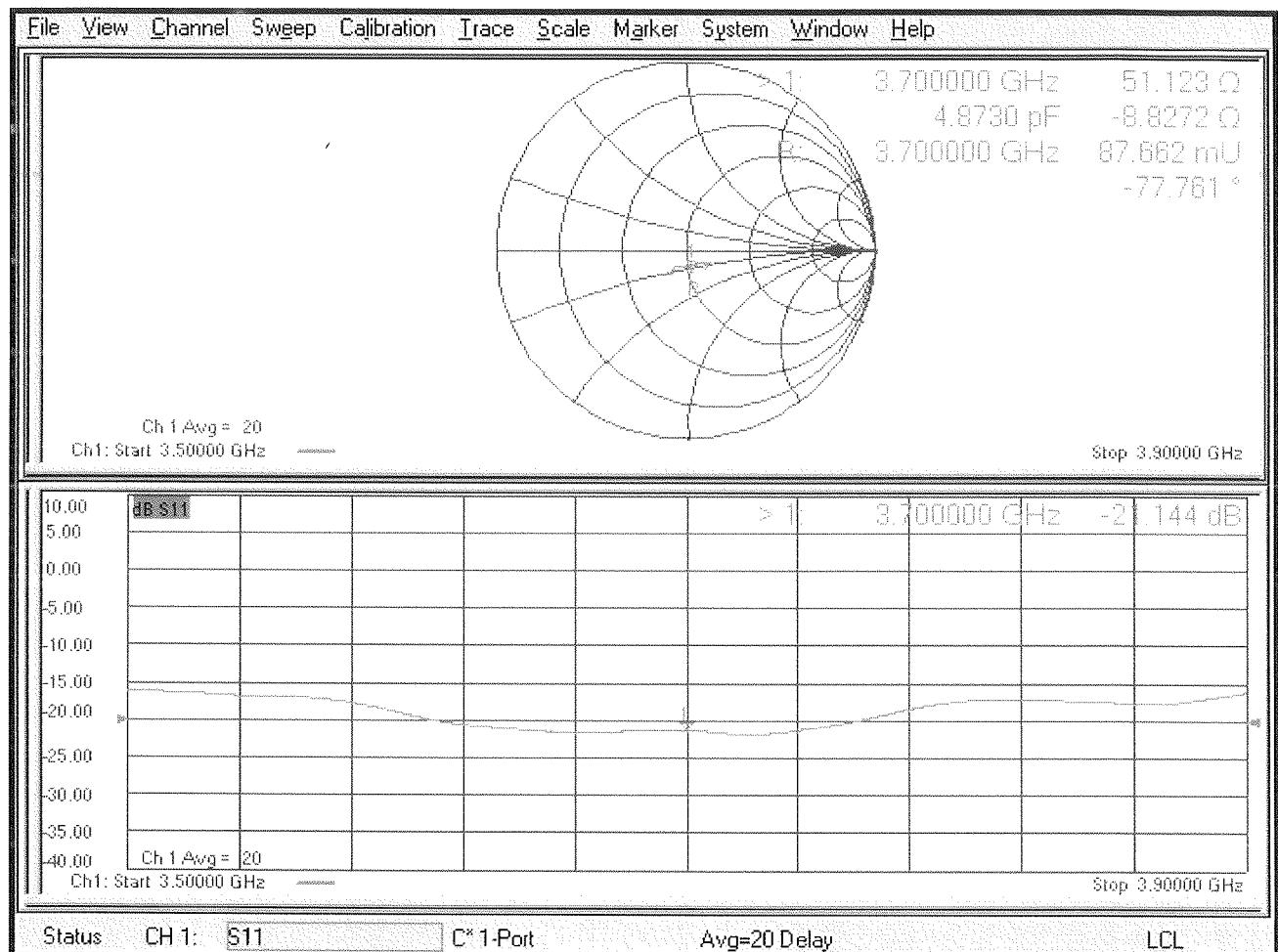
Smallest distance from peaks to all points 3 dB below = 8.2 mm

Ratio of SAR at M2 to SAR at M1 = 73.7%

Maximum value of SAR (measured) = 12.6 W/kg



Impedance Measurement Plot for Head TSL





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 Multilateral Agreement for the recognition of calibration certificates

Client **B.V. ADT**
 Taoyuan City

Accreditation No.: **SCS 0108**

Certificate No. **D5GHzV2-1019_Feb24**

CALIBRATION CERTIFICATE

Object **D5GHzV2 - SN:1019**

Calibration procedure(s) **QA CAL-22.v7**
Calibration Procedure for SAR Validation Sources between 3-10 GHz

Calibration date: **February 13, 2024**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP2	SN: 104778	30-Mar-23 (No. 217-03804/03805)	Mar-24
Power sensor NRP-Z91	SN: 103244	30-Mar-23 (No. 217-03804)	Mar-24
Power sensor NRP-Z91	SN: 103245	30-Mar-23 (No. 217-03805)	Mar-24
Reference 20 dB Attenuator	SN: BH9394 (20k)	30-Mar-23 (No. 217-03809)	Mar-24
Type-N mismatch combination	SN: 310982 / 06327	30-Mar-23 (No. 217-03810)	Mar-24
Reference Probe EX3DV4	SN: 3503	07-Mar-23 (No. EX3-3503_Mar23)	Mar-24
DAE4	SN: 601	30-Jan-24 (No. DAE4-601_Jan24)	Jan-25
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-22)	In house check: Oct-24
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-22)	In house check: Oct-24
Power sensor HP 8481A	SN: MY41093315	07-Oct-15 (in house check Oct-22)	In house check: Oct-24
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-22)	In house check: Oct-24
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-22)	In house check: Oct-24

Calibrated by:	Name	Function	Signature
	Paulo Pina	Laboratory Technician	
Approved by:	Sven Kühn	Technical Manager	

Issued: February 16, 2024

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- a) IEC/IEEE 62209-1528, "Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
- b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- c) DASY System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The source is mounted in a touch configuration below the center marking of the flat phantom.
- *Return Loss:* This parameter is measured with the source positioned under the liquid filled phantom (as described in the measurement condition clause). The Return Loss ensures low reflected power. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	$dx, dy = 4.0 \text{ mm}, dz = 1.4 \text{ mm}$	Graded Ratio = 1.4 (Z direction)
Frequency	$5250 \text{ MHz} \pm 1 \text{ MHz}$ $5600 \text{ MHz} \pm 1 \text{ MHz}$ $5800 \text{ MHz} \pm 1 \text{ MHz}$	

Head TSL parameters at 5250 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.9	4.71 mho/m
Measured Head TSL parameters	$(22.0 \pm 0.2) \text{ °C}$	$36.0 \pm 6 \text{ %}$	$4.53 \text{ mho/m} \pm 6 \text{ %}$
Head TSL temperature change during test	$< 0.5 \text{ °C}$	----	----

SAR result with Head TSL at 5250 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.03 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	80.2 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.30 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.0 W/kg ± 19.5 % (k=2)

Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	$(22.0 \pm 0.2) \text{ °C}$	$35.3 \pm 6 \text{ %}$	$4.89 \text{ mho/m} \pm 6 \text{ %}$
Head TSL temperature change during test	$< 0.5 \text{ °C}$	----	----

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.31 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	82.9 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.37 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.6 W/kg ± 19.5 % (k=2)

Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.3	5.27 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.1 ± 6 %	5.12 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.05 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	80.3 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.28 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	22.7 W/kg ± 19.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 5250 MHz

Impedance, transformed to feed point	52.1 Ω - 3.6 $j\Omega$
Return Loss	- 27.8 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	56.8 Ω - 0.4 $j\Omega$
Return Loss	- 23.9 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	57.4 Ω + 5.9 $j\Omega$
Return Loss	- 21.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.203 ns
----------------------------------	----------

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
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DASY5 Validation Report for Head TSL

Date: 13.02.2024

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1019

Communication System: UID 0 - CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz

Medium parameters used: $f = 5250 \text{ MHz}$; $\sigma = 4.53 \text{ S/m}$; $\epsilon_r = 36$; $\rho = 1000 \text{ kg/m}^3$

Medium parameters used: $f = 5600 \text{ MHz}$; $\sigma = 4.89 \text{ S/m}$; $\epsilon_r = 35.3$; $\rho = 1000 \text{ kg/m}^3$

Medium parameters used: $f = 5800 \text{ MHz}$; $\sigma = 5.12 \text{ S/m}$; $\epsilon_r = 35.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.5, 5.5, 5.5) @ 5250 MHz, ConvF(5.1, 5.1, 5.1) @ 5600 MHz, ConvF(5.01, 5.01, 5.01) @ 5800 MHz; Calibrated: 07.03.2023
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2024
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 71.48 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 27.5 W/kg

SAR(1 g) = 8.03 W/kg; SAR(10 g) = 2.30 W/kg

Smallest distance from peaks to all points 3 dB below = 7.2 mm

Ratio of SAR at M2 to SAR at M1 = 70.4%

Maximum value of SAR (measured) = 18.2 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 70.93 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 31.0 W/kg

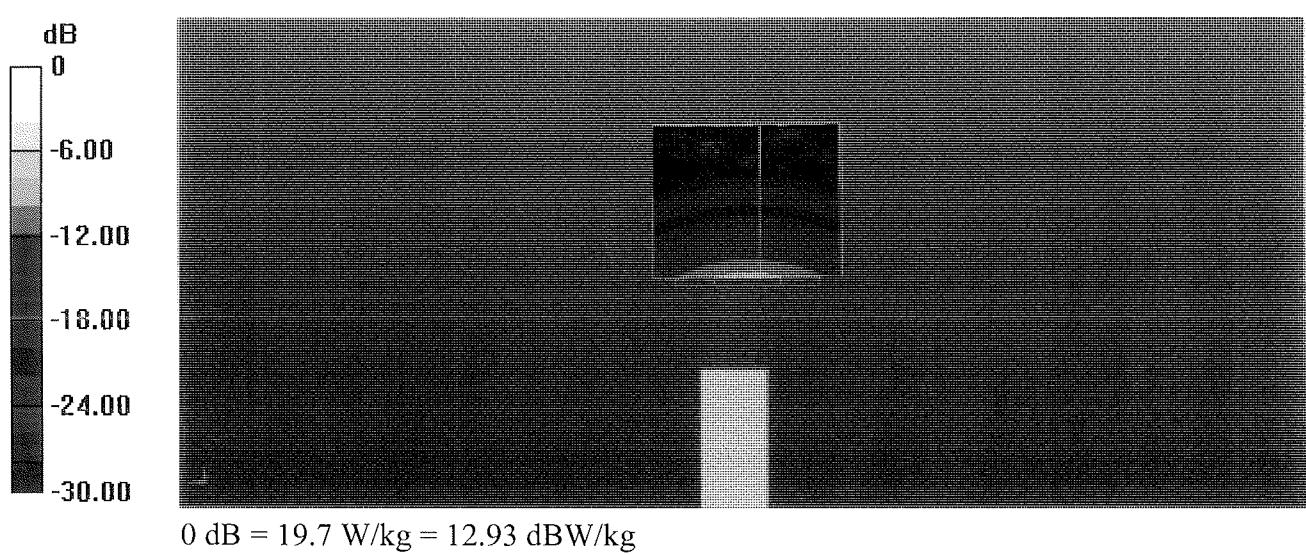
SAR(1 g) = 8.31 W/kg; SAR(10 g) = 2.37 W/kg

Smallest distance from peaks to all points 3 dB below = 7.4 mm

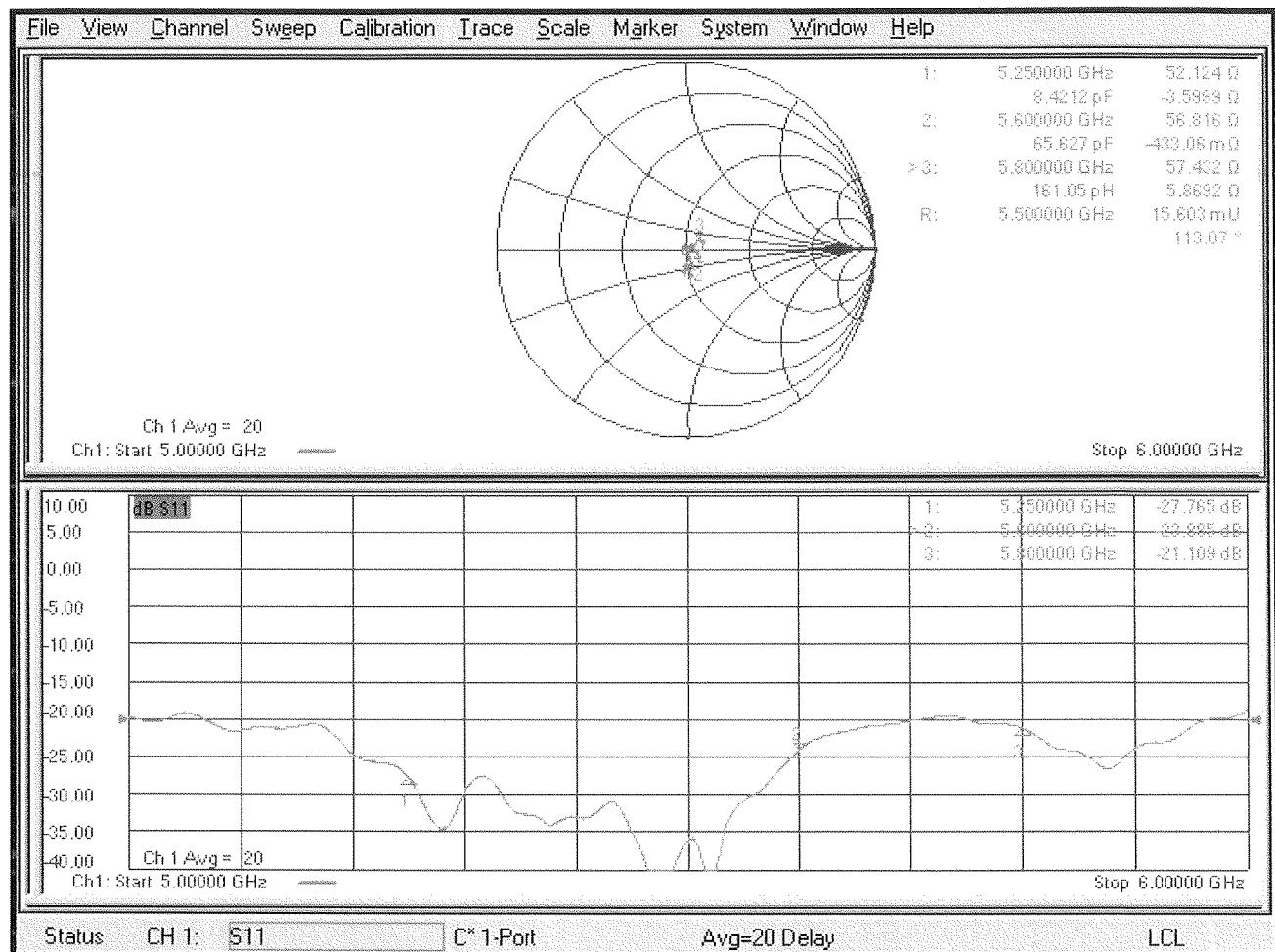
Ratio of SAR at M2 to SAR at M1 = 67.6%

Maximum value of SAR (measured) = 19.7 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 68.71 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 31.9 W/kg
SAR(1 g) = 8.05 W/kg; SAR(10 g) = 2.28 W/kg
Smallest distance from peaks to all points 3 dB below = 7.5 mm
Ratio of SAR at M2 to SAR at M1 = 65.5%
Maximum value of SAR (measured) = 19.2 W/kg



Impedance Measurement Plot for Head TSL





Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 0108**

The Swiss Accreditation Service is one of the signatories to the EA
 Multilateral Agreement for the recognition of calibration certificates

Client **B.V. ADT**
 Taoyuan City

Certificate No. **D6.5GHzV2-1008_Sep23**

CALIBRATION CERTIFICATE

Object	D6.5GHzV2 - SN:1008																																														
Calibration procedure(s)	QA CAL-22.v7 Calibration Procedure for SAR Validation Sources between 3-10 GHz																																														
Calibration date:	September 21, 2023																																														
<p>This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.</p> <p>All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.</p> <p>Calibration Equipment used (M&TE critical for calibration)</p>																																															
<table border="1"> <thead> <tr> <th>Primary Standards</th><th>ID #</th><th>Cal Date (Certificate No.)</th><th>Scheduled Calibration</th></tr> </thead> <tbody> <tr> <td>Power sensor R&S NRP33T</td><td>SN: 100967</td><td>03-Apr-23 (No. 217-03806)</td><td>Apr-24</td></tr> <tr> <td>Reference 20 dB Attenuator</td><td>SN: BH9394 (20k)</td><td>30-Mar-23 (No. 217-03809)</td><td>Mar-24</td></tr> <tr> <td>Mismatch combination</td><td>SN: 84224 / 360D</td><td>03-Apr-23 (No. 217-03812)</td><td>Apr-24</td></tr> <tr> <td>Reference Probe EX3DV4</td><td>SN: 7405</td><td>12-Jun-23 (No. EX3-7405_Jun23)</td><td>Jun-24</td></tr> <tr> <td>DAE4</td><td>SN: 908</td><td>03-Jul-23 (No. DAE4-908_Jul23)</td><td>Jul-24</td></tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Secondary Standards</th><th>ID #</th><th>Check Date (in house)</th><th>Scheduled Check</th></tr> </thead> <tbody> <tr> <td>RF generator Anapico APSIN20G</td><td>SN: 827</td><td>18-Dec-18 (in house check Dec-21)</td><td>In house check: Dec-23</td></tr> <tr> <td>Power sensor NRP-Z23</td><td>SN: 100169</td><td>10-Jan-19 (in house check Nov-22)</td><td>In house check: Nov-23</td></tr> <tr> <td>Power sensor NRP-18T</td><td>SN: 100950</td><td>28-Sep-22 (in house check Nov-22)</td><td>In house check: Nov-23</td></tr> <tr> <td>Network Analyzer Keysight E5063A</td><td>SN:MY54504221</td><td>31-Oct-19 (in house check Oct-22)</td><td>In house check: Oct-25</td></tr> </tbody> </table>				Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration	Power sensor R&S NRP33T	SN: 100967	03-Apr-23 (No. 217-03806)	Apr-24	Reference 20 dB Attenuator	SN: BH9394 (20k)	30-Mar-23 (No. 217-03809)	Mar-24	Mismatch combination	SN: 84224 / 360D	03-Apr-23 (No. 217-03812)	Apr-24	Reference Probe EX3DV4	SN: 7405	12-Jun-23 (No. EX3-7405_Jun23)	Jun-24	DAE4	SN: 908	03-Jul-23 (No. DAE4-908_Jul23)	Jul-24	Secondary Standards	ID #	Check Date (in house)	Scheduled Check	RF generator Anapico APSIN20G	SN: 827	18-Dec-18 (in house check Dec-21)	In house check: Dec-23	Power sensor NRP-Z23	SN: 100169	10-Jan-19 (in house check Nov-22)	In house check: Nov-23	Power sensor NRP-18T	SN: 100950	28-Sep-22 (in house check Nov-22)	In house check: Nov-23	Network Analyzer Keysight E5063A	SN:MY54504221	31-Oct-19 (in house check Oct-22)	In house check: Oct-25
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Calibrated by:	Name Jeton Kastrati	Function Laboratory Technician	Signature 																																												
Approved by:	Sven Kühn	Technical Manager																																													
<p>Issued: September 21, 2023</p> <p>This calibration certificate shall not be reproduced except in full without written approval of the laboratory.</p>																																															



Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- IEC/IEEE 62209-1528, "Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range Of 4 MHz To 10 GHz)", October 2020.

Additional Documentation:

- DASY System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The Return Loss ensures low reflected power. No uncertainty required.
- SAR measured:* SAR measured at the stated antenna input power.
- SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.
- The absorbed power density (APD):* The absorbed power density is evaluated according to Samaras T, Christ A, Kuster N, "Compliance assessment of the epithelial or absorbed power density above 6 GHz using SAR measurement systems", Bioelectromagnetics, 2021 (submitted). The additional evaluation uncertainty of 0.55 dB (rectangular distribution) is considered.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY6	V16.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	5 mm	with Spacer
Zoom Scan Resolution	dx, dy = 3.4 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	6500 MHz \pm 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	34.5	6.07 mho/m
Measured Head TSL parameters	(22.0 \pm 0.2) °C	33.3 \pm 6 %	6.09 mho/m \pm 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	29.4 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	292 W/kg \pm 24.7 % (k=2)

SAR averaged over 8 cm ³ (8 g) of Head TSL	Condition	
SAR measured	100 mW input power	6.65 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	65.9 W/kg \pm 24.4 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	5.44 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	53.9 W/kg \pm 24.4 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.2 Ω - 6.9 $j\Omega$
Return Loss	- 23.0 dB

APD (Absorbed Power Density)

APD averaged over 1 cm ²	Condition	
APD measured	100 mW input power	291 W/m ²
APD measured	normalized to 1W	2910 W/m ² \pm 29.2 % (k=2)

APD averaged over 4 cm ²	condition	
APD measured	100 mW input power	133 W/m ²
APD measured	normalized to 1W	1330 W/m ² \pm 28.9 % (k=2)

*The reported APD values have been derived using the psSAR1g and psSAR8g.

General Antenna Parameters and Design

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
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DASY6 Validation Report for Head TSL

Measurement Report for D6.5GHz-1008, UID 0 -, Channel 6500 (6500.0MHz)

Device under Test Properties

Name, Manufacturer	Dimensions [mm]	IMEI	DUT Type
D6.5GHz	10.0 x 10.0 x 10.0	SN: 1008	-

Exposure Conditions

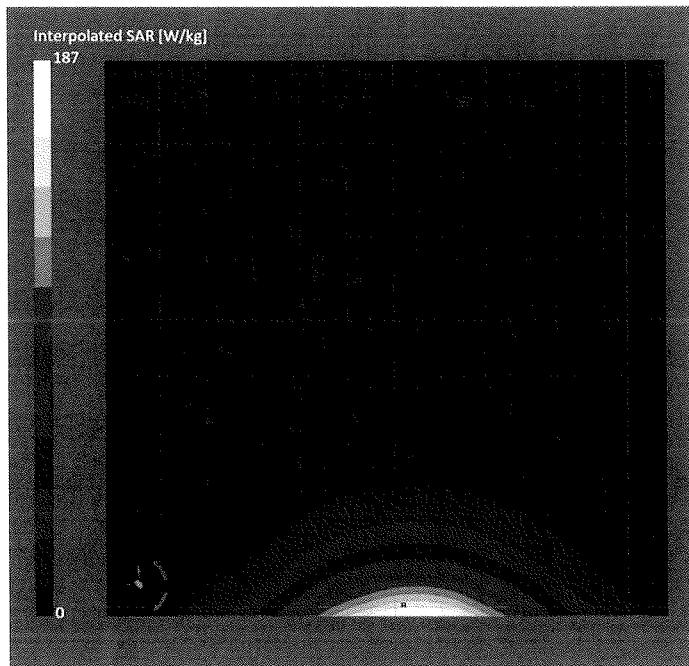
Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz]	Conversion Factor	TSL Cond. [S/m]	TSL Permittivity
Flat, HSL	5.00	Band	CW,	6500	5.50	6.09	33.3

Hardware Setup

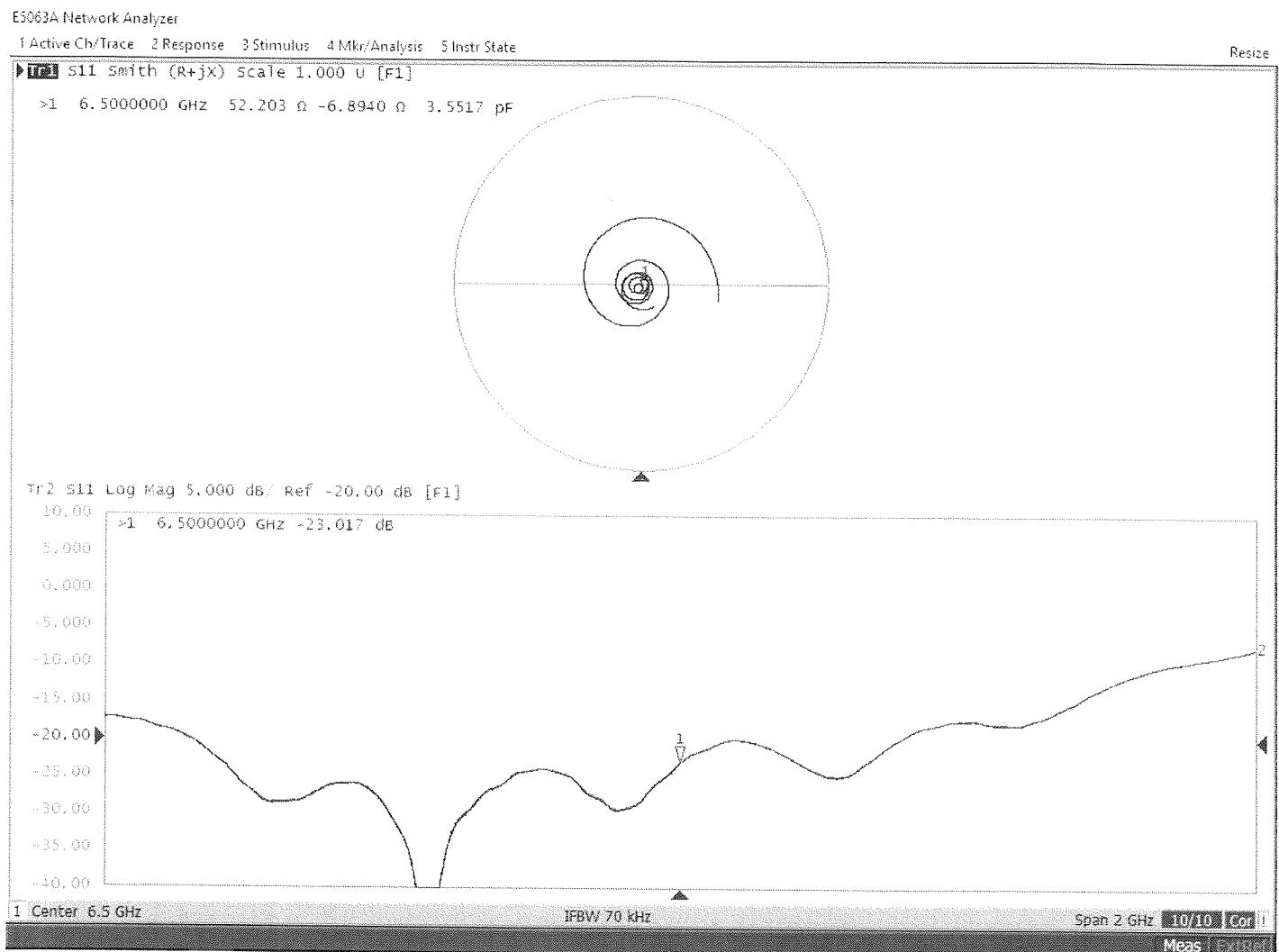
Phantom	TSL	Probe, Calibration Date	DAE, Calibration Date
MFP V8.0 Center - 1182	HBBL600-10000V6	EX3DV4 - SN7405, 2023-06-12	DAE4 Sn908, 2023-07-03

Scan Setup

	Zoom Scan	Zoom Scan
Grid Extents [mm]	22.0 x 22.0 x 22.0	Date
Grid Steps [mm]	3.4 x 3.4 x 1.4	psSAR1g [W/Kg]
Sensor Surface [mm]	1.4	psSAR8g [W/Kg]
Graded Grid	Yes	psSAR10g [W/Kg]
Grading Ratio	1.4	Power Drift [dB]
MAIA	N/A	Power Scaling
Surface Detection	VMS + 6p	Scaling Factor [dB]
Scan Method	Measured	TSL Correction
		M2/M1 [%]
		Dist 3dB Peak [mm]



Impedance Measurement Plot for Head TSL





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 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **B.V. ADT**
 Taoyuan City

Certificate No. **5G-Veri10-1025_Jan24**

CALIBRATION CERTIFICATE

Object **5G Verification Source 10 GHz - SN: 1025**

Calibration procedure(s) **QA CAL-45.v4**
 Calibration procedure for sources in air above 6 GHz

Calibration date: **January 18, 2024**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^\circ\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Reference Probe EUmmWV3	SN: 9374	04-Dec-23 (No. EUmm-9374_Dec23)	Dec-24
DAE4	SN: 1215	29-Jun-23 (No. DAE4-1215_Jun23)	Jun-24
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMF100A	SN: 100184	29-Nov-23 (in house check Nov-23)	In house check: Nov-24
Power sensor R&S NRP18S-10	SN: 101258	29-Nov-23 (in house check Nov-23)	In house check: Nov-24
Network Analyzer Keysight E5063A	SN: MY54504221	31-Oct-19 (in house check Oct-22)	In house check: Oct-25

Calibrated by: Name **Joanna Lleshaj** Function **Laboratory Technician**

Signature

Approved by: Name **Sven Kühn** Function **Technical Manager**

Signature

Issued: January 19, 2024

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



Glossary

Accredited by the Swiss Accreditation Service (SAS)

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 Multilateral Agreement for the recognition of calibration certificates

CW Continuous wave

Calibration is Performed According to the Following Standards

- Internal procedure QA CAL-45, Calibration procedure for sources in air above 6 GHz.
- IEC/IEEE 63195-1, "Assessment of power density of human exposure to radio frequency fields from wireless devices in close proximity to the head and body (frequency range of 6 GHz to 300 GHz)", May 2022

Methods Applied and Interpretation of Parameters

- Coordinate System:* z-axis in the waveguide horn boresight, x-axis is in the direction of the E-field, y-axis normal to the others in the field scanning plane parallel to the horn flare and horn flange.
- Measurement Conditions:* (1) 10 GHz: The radiated power is the forward power to the horn antenna minus ohmic and mismatch loss. The forward power is measured prior and after the measurement with a power sensor. During the measurements, the horn is directly connected to the cable and the antenna ohmic and mismatch losses are determined by far-field measurements. (2) 30, 45, 60 and 90 GHz: The verification sources are switched on for at least 30 minutes. Absorbers are used around the probe cub and at the ceiling to minimize reflections.
- Horn Positioning:* The waveguide horn is mounted vertically on the flange of the waveguide source to allow vertical positioning of the EUmmW probe during the scan. The plane is parallel to the phantom surface. Probe distance is verified using mechanical gauges positioned on the flare of the horn.
- E- field distribution:* E field is measured in two x-y-plane (10mm, 10mm + $\lambda/4$) with a vectorial E-field probe. The E-field value stated as calibration value represents the E-field-maxima and the averaged (1cm^2 and 4cm^2) power density values at 10mm in front of the horn.
- Field polarization:* Above the open horn, linear polarization of the field is expected. This is verified graphically in the field representation.

Calibrated Quantity

- Local peak E-field (V/m) and average of peak spatial components of the poynting vector (W/m^2) averaged over the surface area of 1cm^2 and 4cm^2 at the nominal operational frequency of the verification source. Both square and circular averaging results are listed.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY8 Module mmWave		V3.2
Phantom	5G Phantom		
Distance Horn Aperture - plane	10 mm		
Number of measured planes	2 (10mm, 10mm + $\lambda/4$)		
Frequency	10 GHz \pm 10 MHz		

Calibration Parameters, 10 GHz

Circular Averaging

Distance Horn Aperture to Measured Plane	$Prad^1$ (mW)	Max E-field (V/m)	Uncertainty (k = 2)	Avg Power Density Avg (psPDn+, psPDtot+, psPDmod+) (W/m ²)	Uncertainty (k = 2)
				1 cm ² 4 cm ²	
10 mm	93.3	153	1.27 dB	60.4 56.2	1.28 dB

Distance Horn Aperture to Measured Plane	$Prad^1$ (mW)	Max E-field (V/m)	Uncertainty (k = 2)	Power Density psPDn+, psPDtot+, psPDmod+ (W/m ²)	Uncertainty (k = 2)
				1 cm ² 4 cm ²	
10 mm	93.3	153	1.27 dB	60.2, 60.4, 60.6 55.9, 56.2, 56.4	1.28 dB

Square Averaging

Distance Horn Aperture to Measured Plane	$Prad^1$ (mW)	Max E-field (V/m)	Uncertainty (k = 2)	Avg Power Density Avg (psPDn+, psPDtot+, psPDmod+) (W/m ²)	Uncertainty (k = 2)
				1 cm ² 4 cm ²	
10 mm	93.3	153	1.27 dB	60.4 56.0	1.28 dB

Distance Horn Aperture to Measured Plane	$Prad^1$ (mW)	Max E-field (V/m)	Uncertainty (k = 2)	Power Density psPDn+, psPDtot+, psPDmod+ (W/m ²)	Uncertainty (k = 2)
				1 cm ² 4 cm ²	
10 mm	93.3	153	1.27 dB	60.2, 60.4, 60.6 55.7, 56.0, 56.3	1.28 dB

Max Power Density

Distance Horn Aperture to Measured Plane	$Prad^1$ (mW)	Max E-field (V/m)	Uncertainty (k = 2)	Max Power Density Sn, Stot, Stot (W/m ²)	Uncertainty (k = 2)
10 mm	93.3	153	1.27 dB	61.9, 61.9, 62.1	1.28 dB

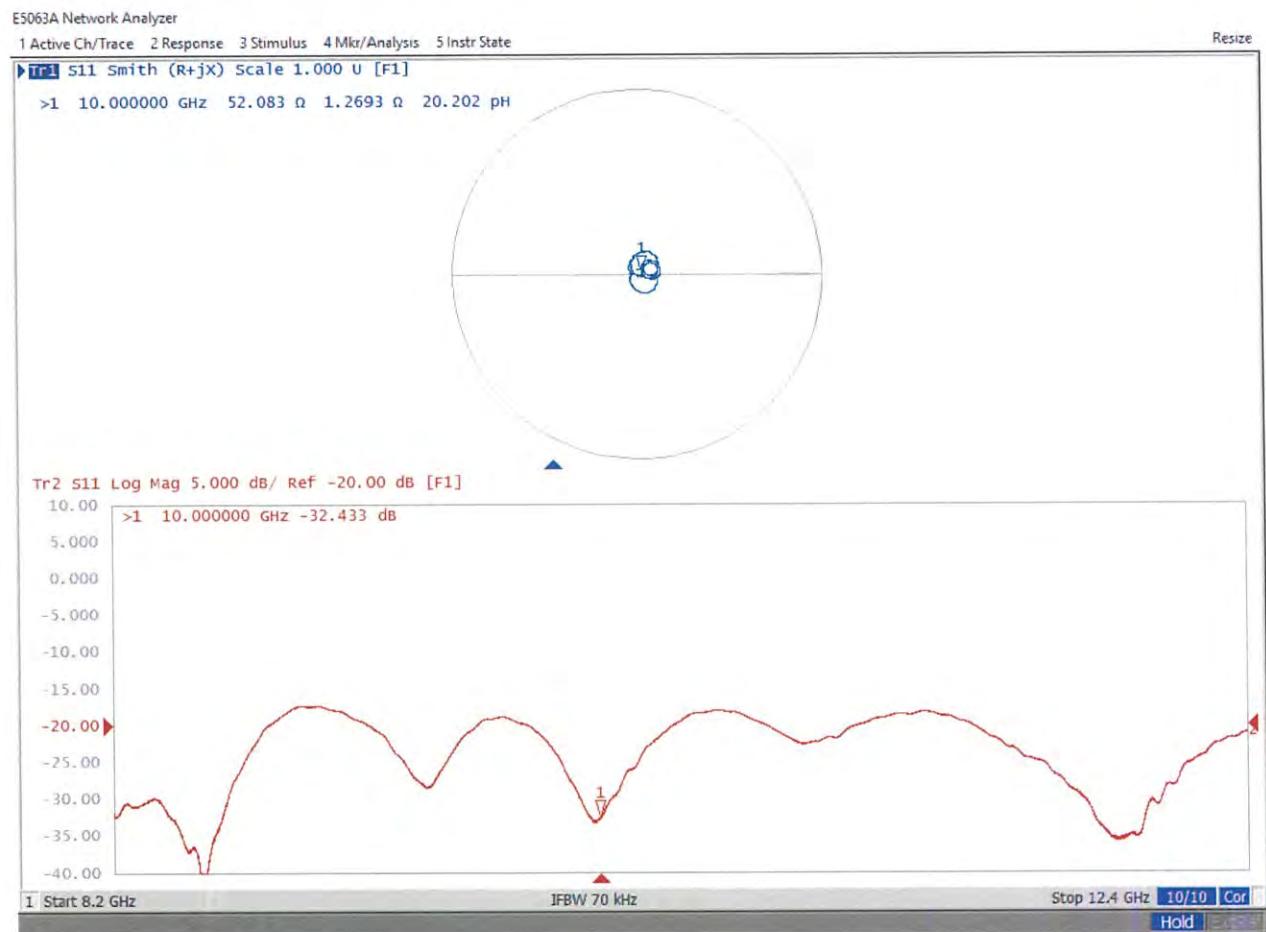
¹ Assessed ohmic and mismatch loss plus numerical offset: 0.30 dB

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters

Impedance, transformed to feed point	52.0 Ω + 1.2 $j\Omega$
Return Loss	- 32.4 dB

Impedance Measurement Plot



DASY Report

Measurement Report for 5G Verification Source 10 GHz, UID 0 -, Channel 10000 (10000.0MHz)

Device under Test Properties

Name, Manufacturer	Dimensions [mm]	IMEI	DUT Type
5G Verification Source 10 GHz	100.0 x 100.0 x 172.0	SN: 1025	-

Exposure Conditions

Phantom Section	Position, Test Distance [mm]	Band	Group,	Frequency [MHz], Channel Number	Conversion Factor
5G -	10.0 mm	Validation band	CW	10000.0, 10000	1.0

Hardware Setup

Phantom	Medium	Probe, Calibration Date	DAE, Calibration Date
mmWave Phantom - 1002	Air	EUmmWV3 - SN9374_F1-55GHz, 2023-12-04	DAE4 Sn1215, 2023-06-29

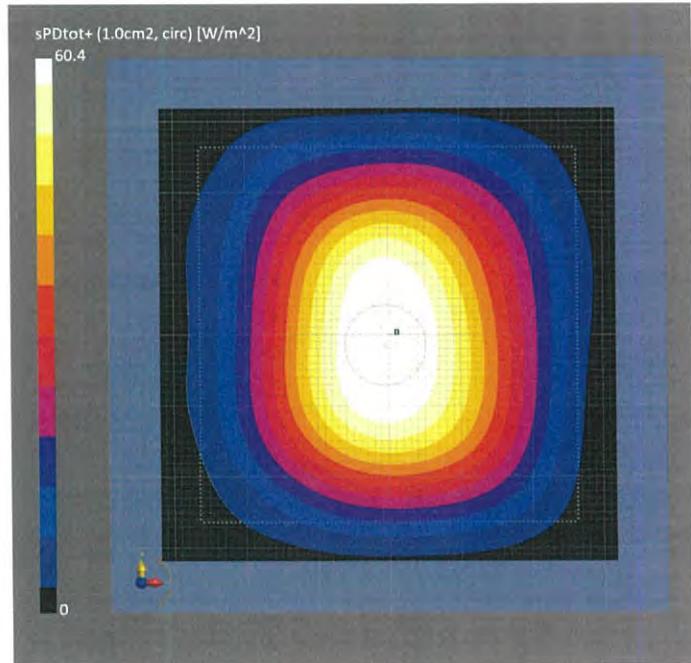
Scan Setup

Sensor Surface [mm]	5G Scan
MAIA	10.0 MAIA not used

Measurement Results

5G Scan
2024-01-18, 12:50
1.00
Circular Averaging
60.2
60.4
60.6
61.9
61.9
62.1
153
-0.04

Date
Avg. Area [cm²]
Avg. Type
psPDn+ [W/m²]
psPDtot+ [W/m²]
psPDmod+ [W/m²]
Max(Sn) [W/m²]
Max(Stot) [W/m²]
Max(|Stot|) [W/m²]
E_{max} [V/m]
Power Drift [dB]



DASY Report

Measurement Report for 5G Verification Source 10 GHz, UID 0 -, Channel 10000 (10000.0MHz)

Device under Test Properties

Name, Manufacturer	Dimensions [mm]	IMEI	DUT Type
5G Verification Source 10 GHz	100.0 x 100.0 x 172.0	SN: 1025	-

Exposure Conditions

Phantom Section	Position, Test Distance [mm]	Band	Group,	Frequency [MHz], Channel Number	Conversion Factor
5G -	10.0 mm	Validation band	CW	10000.0, 10000	1.0

Hardware Setup

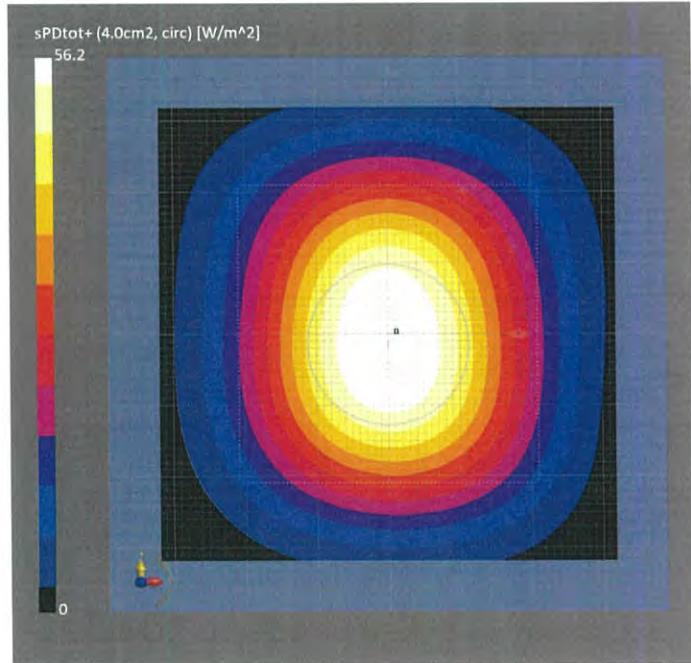
Phantom	Medium	Probe, Calibration Date	DAE, Calibration Date
mmWave Phantom - 1002	Air	EUmmWV3 - SN9374_F1-55GHz, 2023-12-04	DAE4 Sn1215, 2023-06-29

Scan Setup

Sensor Surface [mm]	5G Scan
MAIA	10.0 MAIA not used

Measurement Results

5G Scan
2024-01-18, 12:50
4.00
Circular Averaging
55.9
56.2
56.4
61.9
61.9
62.1
153
-0.04



DASY Report

Measurement Report for 5G Verification Source 10 GHz, UID 0 -, Channel 10000 (10000.0MHz)

Device under Test Properties

Name, Manufacturer	Dimensions [mm]	IMEI	DUT Type
5G Verification Source 10 GHz	100.0 x 100.0 x 172.0	SN: 1025	-

Exposure Conditions

Phantom Section	Position, Test Distance [mm]	Band	Group,	Frequency [MHz], Channel Number	Conversion Factor
5G -	10.0 mm	Validation band	CW	10000.0, 10000	1.0

Hardware Setup

Phantom	Medium	Probe, Calibration Date	DAE, Calibration Date
mmWave Phantom - 1002	Air	EUmmWV3 - SN9374_F1-55GHz, 2023-12-04	DAE4 Sn1215, 2023-06-29

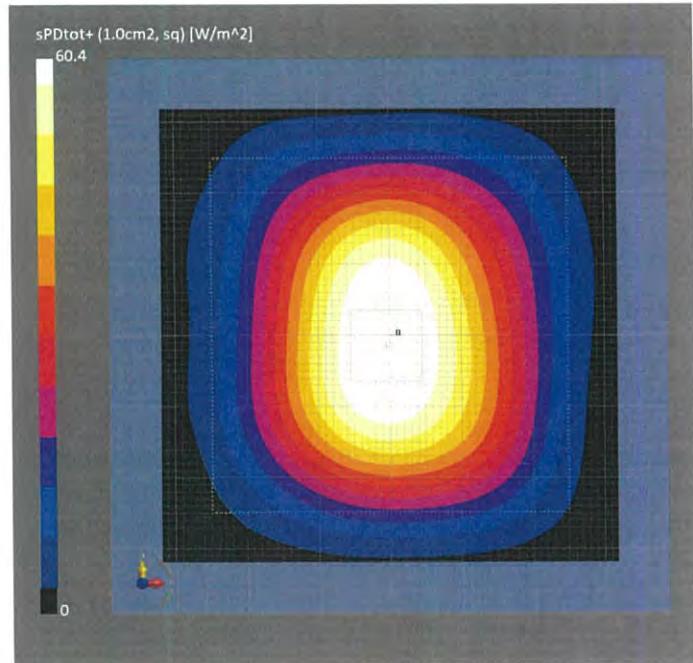
Scan Setup

Sensor Surface [mm]	5G Scan
MAIA	10.0 MAIA not used

Measurement Results

5G Scan
2024-01-18, 12:50
1.00
Square Averaging
60.2
60.4
60.6
61.9
61.9
62.1
153
-0.04

Date
Avg. Area [cm²]
Avg. Type
psPDn+ [W/m²]
psPDtot+ [W/m²]
psPDmod+ [W/m²]
Max(Sn) [W/m²]
Max(Stot) [W/m²]
Max(|Stot|) [W/m²]
E_{max} [V/m]
Power Drift [dB]



DASY Report

Measurement Report for 5G Verification Source 10 GHz, UID 0 -, Channel 10000 (10000.0MHz)

Device under Test Properties

Name, Manufacturer	Dimensions [mm]	IMEI	DUT Type
5G Verification Source 10 GHz	100.0 x 100.0 x 172.0	SN: 1025	-

Exposure Conditions

Phantom Section	Position, Test Distance [mm]	Band	Group,	Frequency [MHz], Channel Number	Conversion Factor
5G -	10.0 mm	Validation band	CW	10000.0, 10000	1.0

Hardware Setup

Phantom	Medium	Probe, Calibration Date	DAE, Calibration Date
mmWave Phantom - 1002	Air	EUmmWV3 - SN9374_F1-55GHz, 2023-12-04	DAE4 Sn1215, 2023-06-29

Scan Setup

Sensor Surface [mm]	5G Scan
MAIA	10.0 MAIA not used

Measurement Results

5G Scan
2024-01-18, 12:50
4.00
Square Averaging
55.7
56.0
56.3
61.9
61.9
62.1
153
-0.04

